UNIVERSITY OF PENNSYLVANIA

PHYSIOLOGICAL MATURITY IN RELATION TO CERTAIN CHARACTERISTICS OF BOYS AND GIRLS

A Study of School Children in New Britain, Connecticut

MARY A. LEAL

A THESIS

IN EDUCATION

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY

PHILADELPHIA
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FOREWORD

The success of an investigation of the sort undertaken in this paper depends in large part on the willingness and the interest of those persons in the school system who supply the material. This study would have been impossible without the assistance of the school physicians, Doctor Marie P. Levinson and Doctor V. J. Smith, of Miss Millie G. McAuley, Principal's Assistant in the high school, Miss Anne O'Brien, of the commerce department in the Elihu Burritt junior high, of Miss Grace C. Collins, of Miss Frances Peirce of the Center junior high, and of Miss Grace Schmidt and Miss Mary Gorman of the elementary school. The greatest responsibility in the matter rested with Doctor Levinson, who superintended the transferring of all the records from the health cards and with Miss Schmidt and Miss Gorman who, besides securing the elementary school records, checked up on missing material. Anyone who has done work of this kind will appreciate the value of such coöperation as I received at New Britain through the courtesy of Mr. Stanley H. Holmes, the superintendent of schools. I am indeed grateful to those persons who helped me.

The success of an investigation of this sort also depends in large part on the interest and assistance, to say nothing of encouragement, given to the investigator by the members of his committee and by those others who have given of their time to him. In this case I am indebted to Doctor Arthur J. Jones, Doctor E. D. Grizzell, Doctor Francis M. Garver, and Doctor Harl R. Douglass for their assistance as members of my committee, and to Doctor George Gailey Chambers for his special help in statistics. Especially am I indebted to Doctor Jones for his patient persistence in keeping open the vista to a new line of work.

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Physiological Maturity in Relation to Certain Characteristics of Boys and Girls

I

The Problem

1. *The Field*

The importance of the beginning of physiological maturity is an acknowledged fact. In primitive times, the changed type of education and the impressive ceremony of initiation came when the child was about fifteen, presumably adolescent. Modern primitive tribes follow the same custom of making physical maturity an important turning point in the lives of boys and girls. Among the early Greeks, who were far from being primitive, this turning point was emphasized by religious and civil ceremonies, and the importance of the moment to the boy was probably not in any way diminished by his assumption of adult dress and the cutting of his hair. On his thirteenth birthday the orthodox Jewish boy of today receives his tefillin, the badge of manhood, his responsibility for fulfilling the law. Child labor and compulsory school laws are based on the theory that at sixteen children are physically mature and able to shift for themselves. In fact, secondary education from the very beginning has meant really the education of the adolescent and has been differentiated from elementary education on the assumption that adolescence marks a turning point of some sort in the life of the child.

So far as is known, however, in all these cases, a definite chronological age has been taken for the turning point between childhood and youth. The beginning of physiological maturity is not easily recognized; one stage of maturing passes for the most part quietly into another and, to his relatives, a child suddenly "grows up". The fifteen years of tradition is recognized now as merely an approximation of maturity for most children; but the difficulty in obtaining objective signs that would permit of a more accurate estimate of physiological development is recognized also, so that, for the most part, maturing is acknowledged in many ways, but then passed over in connection with results. But the importance of the beginning of physiological maturity is an acknowledged fact.

2. *Summary of Existing Studies*

Most of the studies dealing with this subject are studies of what is called "the adolescent". Certain traits are attributed to him and so make up the list of what are called "adolescent traits". Generally, however, some trait or other is labeled "adolescent' because it occurs when a child is about eleven or twelve years of age. It is so labeled on the assumption that since adolescence, i.e., maturing, comes along at about eleven or twelve years of age, the trait belongs to adolescence. For instance, an "adolescent" increase in weight and height may or may not be due to adolescence so far as *proof* of the relationship between the two goes in most cases. Girls, for instance, grow rapidly from about six to eight (2, p. 12) and from about twelve to fourteen, and the second growth is labeled "adolescent increase". Perhaps it is, but unless the increase is tied up to maturity by something stronger than chronological age, it cannot in fairness be called "adolescent growth".

Studies dealing with the adolescent are not based for the most part, upon any commonly accepted objective criteria of physiological maturity. In many cases the investigator gives no indication of what he has taken as criteria. In examining work dealing with the study of physiological maturity, then, it is necessary to be careful to separate studies which deal with children called adolescent because they are eleven or twelve years old from studies which deal with children called adolescent because it has been shown in a physical examination that they are adolescent. The following summary gives the outstanding studies dealing with the age of maturing, in which the recognition of maturing has in most cases, been based on definite criteria and not merely on a noting of "adolescent" spurts of various sorts.

Studies Dealing with the Age of Maturing

There are several contributions dealing with the age of maturing.

Boys

Crampton (7, p. 141) in his examination of 3835 boys in the New York City high schools finds that the middle year for the majority

of boys to become pubescent is 13.5–14.5. At 12.25 he finds 81 per cent of the boys pre-pubescent. It must be remembered, however, that since Crampton's boys are high school boys, his group is decidedly selected, especially in the lower ages because many 12, 13, and 14 year old boys will not have reached the 9th grade. Crampton calls attention to the rapid disappearance of the immature group.

Baldwin (3, p. 189) rechecked figures belonging to other investigators covering a total of 4917 boys and found for them, pre-pubescent from 8.5–16 (country boys) and 9.5–17.5 (city boys); pubescent, 9.5–15, mode (country) 13.5, and 10–18, mode (city) 14—about the same as Crampton. Post-pubescent were from 11.5–24 (country) and 12.5–24 (city).

The median for the 1876 New Britain pubescent boys (see p. 42 of this study) is 13.29 with a range of from 9–18. Selection operates most in connection with Crampton's figures; it operates in connection with New Britain's, and probably in connection with Baldwin's. Hence we cannot yet determine with any exactness what the median for all boys is. (See p. 23–24).

Lewis (18, p. 312) examined 100 boys entering the freshman class in the Worcester High School, February, 1916, with a view to securing their distribution according to the types of man as set forth by Bryant and Goldthwait. The boys were divided into pre-pubescent, pubescent, and post-pubescent, the chronological ages ranging from 13–17. Disregarding the division into types of mankind, since it has no bearing on our problem, and summing up all maturing boys for each chronological age gives in this case a median age of 14 for Stage 2 (maturing) boys. Since the selection is obvious—9th grade boys only—and the number of children small—42—the figures are not significant.

Godin (12, p. 69) reports data for 230 boys examined every six months as long as they were in his school. By means of these examinations he established five stages of pubescence as indicated by secondary characteristics. The third stage he considered equivalent to the attainment of puberty. His reason for this assumption is not given. The average age for reaching stage 3 is 15 years 6 months. He, however, pays little attention to this average. He stresses one year of preparation for puberty, two

years after the appearance of puberty for it to establish itself, and three years more for growth to be completed and the person to become adult. The age at which maturing starts varies widely, but the time taken for the process, Godin considers fixed, no matter at what age begun. This time interval, he states, basing his conclusions on studies by Dr. Martha Francillon, is the same for the girls as for the boys. Late maturing Godin considers pathological, since it is in his opinion due to defective nourishment either before or soon after birth.

Girls

The figures for girls in connection with the age of maturing are based, in Baldwin's case, on 388 girls from various schools. The median age for maturity, the beginning of post-pubescence as indicated by the first menstruation, was 13 years 7 months—13 years 9 months (3, p. 19). One must note in comparing the figures for the boys with those for the girls that we are comparing two different stages of maturing. For the boys we can use to advantage only the second stage or pubescent boys, since the first and the third stages are incomplete. This is true because this study deals with school children and not with all children, and this selection distorts these distributions. For these girls in Baldwin's study the age of first menstruation was obtained and hence the age of maturing, but not the age of pubescence, practically settled. For the New Britain girls the median for the second stage or maturing girls must be used in order to get any idea of the age of maturing, since there is no record of the age at maturity. 12.6 is the median for these second-stage girls. Abernethy (1, p. 461) reports a study of 487 Chicago high school girls whose average age of maturing, based on a record of first menstruation was 13 years 6 months.

Many more boys and girls must be examined before the laws governing this aspect of growth can be stated definitely, but so far it looks as if the age of maturing for the average of pubescent boys (not the average boy) comes between 13 and 14 years; the average of first menstruation for girls comes between 13 and 14. The girls are mature when the boys are maturing. For second-stage girls there is only the one median—between 12 and

13—that of the New Britain girls. Although there is little validity in comparing stage 2 of one group and the beginning of stage 3 for another, still the short time between the median for second stage and the median for first menstruation is worth noticing.

Studies Dealing with the Relationship Between Maturing and Physical Measurements

Closely connected with studies of the age of maturing have been studies in which the correlation between physical measurements and physiological age has been given or implied. For example, Freeman and Carter (11, p. 263) worked out for 40 children—20 boys and 20 girls—the ossification ratio for each and plotted the curves according to chronological age. These curves were strikingly similar to the curves for the rates of maturing for boys and girls and consequently it was suggested that the ossification ratio was a satisfactory index of physiological age. That may well be; but since no physiological age was taken for the children of that study, it cannot be relied upon as a fact.

Dunham (9, p. 325) makes the statement that in studying the area of ossification of the carpal bones, the *type* of hand makes no difference in the anatomical development; hence the ossification ratio would be a better ratio than a ratio based on height and weight, since height and weight are dependent on type to a large extent. Dunham also suggests that the eruption of canine and second molars is a good sign of precocity. But there is no evidence of physiological age having been taken for any children connected with the study.

In connection with the carpal bones as indices of physiological age, Baldwin (3, p. 167) cites a high positive correlation between height, weight, and degree of anatomical development. The fallacy in this was noted by Brooks (4, p. 231) who pointed out that Baldwin has a wide range in chronological age (eleven years) for his 49 children and that chronological age correlates highly with mental and physical traits: the older children for the most part are naturally taller, heavier, and mentally older than the younger. If chronological age be held constant, Baldwin's

correlations of .89, .71, and .83 drop to .53, –.15, and .09. Even if this be accepted as significant, the fact still remains that anatomical age and physiological age are not the same thing, and so this relationship is a measure of correlation between height, weight, and physiological age only by inference.

Crampton (7, p. 141) doubts whether height and weight mean much in themselves *unless* physiological age is taken into account, a suggestion which casts doubts upon height and weight as adequate indices of physiological age. Crampton (5, p. 232) does show, however, in a series of tables that the immature and the mature of the same chronological age differ radically in height, weight, and strength, the mature being, on the whole, 30–50 per cent stronger than the immature.

Baldwin (3, p. 137) points out that although boys and girls grow differently, they are more alike in the changes that occur in physical measurements during early adolescence and less alike at seventeen years of age than at any other time. In connection with girls he makes three very definite statements: (1) Girls who mature early are close to the norm in height or below it. This means early maturing girls are *not* noticeably tall. (2) Tall girls, as a rule, mature early. (3) Baldwin concludes that maturing means a cessation of growth in height either immediately upon maturity as in the case of the early maturing girls or shortly before maturity as in the case of the late. In other words, from Baldwin's figures, height appears to be dependent on chronological age rather than on physiological maturity. The early maturing are by no means always the tall children.

Foster (10, p. 87) gives a series of tables showing the close relationship of pubescence to height. About 300 ninth grade boys of New York City were divided into grades according to maturity. "The relationship is so close between height and pubescence that it might seem to a person who had a view of the different classes at the same time as if the classification had been made according to height," writes Foster; but no statement of how these grades were obtained was given. He advises using height as a clue to physiological stage if no physiological examination can be given.

McCurdy (19, p. 1186), using Crampton's criteria, examined in

several consecutive examinations, 212 boys. His findings with respect to physical measurements show an increase in measurements with an increase in maturity.

Brooks (4, p. 237) in a clearly explained, critically evaluated study, reports no high correlations between physical and mental traits, although some low ones are discovered. He points out that his data on physiological age are based on too few cases to warrant the drawing of reliable conclusions.

Some of the laws of growth brought out by these men who have been working on this problem of physiological age follow:

Crampton (7) formulates them

1. Growth rates depend on pubescence, not chronological age
2. Accessions in weight, height, and strength occur at the same time
3. Growth, felt strongly in early pubescence, reaches its climax at or just after puberty (Baldwin says before)
4. The more rapid the development in maturing, the more rapid the gain in growth

Baldwin (3) phrases them

If increments before adolescence are relatively uniform, this uniformity tends to persist throughout adolescence. If there is a retardation before adolescence, there is rapid growth during adolescence.

Wiazemsky (8) gives

1. Periodicity—acceleration followed by retardation
2. Compensation for retardation by growth
3. Correlation—brighter children have apparently balance or excess of energy on the side of vital capacity

Hall (13) makes this statement

1. There is a pubescent acceleration in height and weight
2. There is in this precedence by girls by one or two years
3. Period of slightly diminished growth centering from 8–9 to 10–11
4. Gradual and irregular tapering off of growth in height about 18–19 and in weight a little later.
5. Slight retardation near the period of school entrance with acceleration afterwards

Godin (12 Chapter IX) as a result of his investigations, concludes that

1. Growth occurs according to rhythm
2. Growth in one part of the body alternates with growth in another part

What they amount to in spite of contradictions seems to be this: A child grows in some direction, height for instance, and he gets accustomed to his growth, equalizes proportions in some way; again he grows, and again he gets accustomed to this growth. Some of the growth occurs at or near the time of adolescence. It may or may not be definitely related to adolescence however, for it may be running parallel with it, responding to a rhythm of its own (12, p. 109). Godin's study points this out particularly clearly. The growth in a baby's body is more rapid in the trunk than in the legs. Children "shoot up", but their growth is in the legs; the sitting height changes but slowly. Next they "thicken"; their growth is in the trunk; a gain in height is a gain in sitting height. The graph in Growth During School Age (12) on page 259 shows this strikingly. It gives the straight horizontal line representing the equal standing height of ten boys seventeen years old. Underneath this are the uneven sitting-heights of the same ten boys. The long legs and the short trunks belong to those in the thickening stage. The shooting up stage comes before puberty and the thickening stage after, but it is noticeable that Godin calls these increases "peripuberal" and not "adolescent".

Studies Dealing with the Relationship Between the Type of Maturing and Intelligence

Frequently the question of physiological age and brightness has been examined in various ways, usually a parenthesis in the other studies, but generally introduced somewhere. Crampton (7, p. 235) in his tables shows that in grades 5, 6, and 7 the poorer scholars average 37 per cent, 44 per cent and 46 per cent more advanced in maturity than the good. He then shows that the opposite is true in high school, and accounts for it in the fact that by the time they reach high school the more mature have the greater background. The pre-pubescent are not fitted for high school, he insists. He emphasizes that this applies to scholar-

ship and not to intelligence. All Crampton's estimates of scholarship were based on units of failure in school subjects. On the whole, however, Crampton's figures show that earlier maturing favors better scholarship. In another article (6, p. 119) he warns us that there is not much correlation between physical measurements and scholarship except as physical measurements are related to physiological age.

McCurdy (19, p. 1192) found that the maturing boys had a lower average grade than had either the immature or the mature. He found the percent of failure highest for the mature and lowest for the immature due, however, probably, he said, to the forging ahead of bright young children.

King (15, p. 222) studied a group of children to determine whether or not early maturing is favorable to school progress. Maturity was estimated by a teacher through observance of height and physical appearance as the children passed before her.

Baldwin (3, p. 197) shows that "mental age bears a direct relation to physiological age as indicated by height and weight." At each chronological age the taller and heavier boys and girls have a higher mental age than those of average or below average height and weight. But a high correlation between height and weight and physiological age has not been clearly established; consequently the well-rounded physical acceleration (2 ,p. 21, note) rather than a physiological acceleration may be related to the high mental age.

Brooks (4, p. 237) finds a correlation of .46 between early maturing and IQ for a group of 100 girls; but for another group of 87 he finds $r = .000$. Thus evidence, as Brooks says, is surely not positive.

Abernethy (1, p. 463) finds no relationship between early maturing and high IQ, although she finds the late maturing slow to adjust themselves to the school. She speaks of certain cases of late maturing being "apparently normal" for those girls. The only meaning she gives for normal is that they were behaving like normal children in spite of a so-called abnormal physiological condition.

Studies Dealing with the Relationship Between Physiological Maturity and Grade

There are almost no studies of physiological maturity and grade. Inglis (14, p. 28) and Koos (16, p. 68) present computed tables which estimate the number of children of each stage in each grade (See page 55 of this paper for a discussion of this). The percentages estimated differ radically from those of the New Britain study. That these estimates err in including among the pre-pubescent group many who are maturing is pointed out by Smith (21, p. 140) in his very clear discussion of the problem. A shifting of percentages in accordance with this error would tend to make the figures in the computed tables more nearly agree with the figures in the New Britain study.

These computations by Inglis and Koos are not based upon any actual study of the physiological maturity by grades, and while they are probably fairly accurate on the whole, they cannot be taken as anything more than approximations. Abernethy (1, p. 541) did make a study of 38 children in which she found that the early maturing children are for the most part underage for this group.

Studies Dealing with the Relationship Between Traits and Physiological Maturing

So far as published investigations go, apparently no study has been made of the traits manifested by children in different stages of maturity.

The investigations that have been described briefly have added materially to actual knowledge of physiological maturing. Until very recently practically nothing was known about the subject. Pictures of the conditions of physiological maturing and of the laws controlling these conditions were colored by superstitions. Each of these studies has helped to make more distinct and serviceable the significance of maturing, but it is very apparent that an even more distinct picture of this significance must be made if a path that fits the needs of every boy and every girl is to be charted at all successfully for each child. The relationship of physiological maturing must be more definitely established in

connection with other characters and traits before its full significance can be seen. It is just here that the investigations described give the least help; relationships are not definitely established. The study of New Britain school children here reported was undertaken in the hope that something might be brought to light that would help in filling this gap, something that would help to make somewhat clearer the relationship of physiological maturity to other characteristics of boys and girls.

3. *The New Britain Study: Its Place and Its Purpose*

It would be well to state in the beginning that this particular investigation has nothing to do with physical measurements (height, weight, etc.); some data were obtained, but they have not been used because they seemed to have little significance for the purpose of the study.

This study attempts to contribute something to the picture of physiological maturing. The records of over 4000 school children in grades four to twelve have been examined in order to see:

1. How children of each stage mature year by year so far as this can be judged by an examination of a distribution according to chronological age.

2. How children of each stage progress through school so far as this can be judged by their distribution according to age-grade groups, IQ's, and in some cases, teachers' marks.

3. How children of each stage differ in personality so far as this can be judged by their distribution according to their exhibition of traits in connection with their IQ's.

All the work is based on distributions of a group of children according to a physiological age determined by the examinations of physicians. The details of these examinations are on page 33.

It is dangerous, of course, to draw conclusions as to individual growth from an examination of a large group, but group statistics, if not analyzed too minutely, yield a picture of tendencies that may well be worth something.

Godin's study repeated observations of the same children. The observations were made six months apart since he had concluded from his study of the law of alternations that six months

served in general to cover about one beat in the rhythm of growth. Godin can say and does say that a child grows in a certain way, and the value of his conclusions depends entirely on the validity of his criteria. Since there is in this study of New Britain children only a picture of a group, i.e., a picture of tendencies, it can show merely that at *this* stage children appear *thus;* in *that* situation, *there* is the trend. Nothing further can be concluded without demanding of group material that which it is incapable of giving.

The value of this investigation lies in the validity of the data in respect to physiological maturity. Stage of maturity for each child has been determined by direct observation of skilled physicians and, therefore, can be taken to be actual physiological maturity insofar as the present criteria are valid. It is not a correlated measure.

4. *Requirements for this Type of Study*

If such a study as this is to be of value, it must be made in connection with the same group of children; the points considered must be judged, not only by the same standards, but, to as large an extent as possible, under the same conditions physically, mentally, and psychologically. This is necessary in order to eliminate as far as possible such factors as personal judgment and personal bias.

Of course, in any school system some teachers are more reliable than others in recording items on reports. Differences in attitude, in morale, would introduce an additional invalidating factor into an investigation. These differences in attitude would, of course, be present in any school system or in any school, but they would not ordinarily be so great among the teachers in one fairly large, well-organized system as they would among teachers in several smaller distinct systems. Moreover definite efforts were made over a considerable period to secure a common and a favorable attitude in all the teachers in order that all who had a share in supplying the data might react as nearly as possible in the same way when it came to subjective judgments.

5. *Source of Data for this Study*

The material used in this study came from the public schools

of New Britain, Connecticut, grades four through twelve, omitting all special classes for physical and mental defects and all continuation schools. New Britain was selected partly because it has the reputation of making records, of keeping records, and of being willing to cooperate in things that might prove of value to the children of the city. It was also selected because through the interest of the physicians for the school, physiological age, the indispensable item in the investigation, could be obtained by one man for all the boys and by one woman for all the girls. The study would have been impossible without their aid.

6. *Deficiencies in the Data*

a. Selection

Selection affects, in part, the distributions in this study. There is selection in grade, in IQ, in chronological age, in stage. It operates in the following manner:

In Grade: Children of grades 4–12 inclusive only are included in the study. Any conclusions as to tendencies in connection with progress through school, especially in the lower grades, are subject to question inasmuch as there is no way of telling what sort of tendency might be in existence if the fourth, fifth, and sixth grades had been considered in connection with a study of the first, second, and third rather than merely as the first of the grades from fourth to twelfth. In itself, in its relation to progress through school, selection in grade is probably not serious, but in its contributions to other types of selection as noted below, its effect is far reaching.

In IQ: The slower children of lower IQ would probably be the ones that have remained more than one year in grades 1, 2, or 3. Consequently the children of this study are short a certain number of low IQ s who would be present were it not for this selection by grade spoken of above. The low IQ's would drop out in the senior high and in the other grades after 16 years old.

In chronological age: The slower children of the ages 9, 10, 11, etc., in diminishing numbers as chronological age advances would remain behind in grades 1, 2, and 3 and so not be in this study. In the senior high and after 16, the slower children would leave school. Both these effects would be to eliminate children of the early and

the later chronological ages with respect to low IQ and so make those ages not fully representative of what should be in them.

In Stage: Since grades 1–3 would be made up almost entirely of first and second-stage children, omitting these grades would eliminate children from each of these stages (more from stage 1 than from stage 2) and not to any extent from stage 3. The elimination from the senior high would affect largely the low IQ's of stage 3. The low IQ's would be fewer also in stage 1 than would be expected because those who had remained in grades 1, 2, and 3 would not appear in this study. There is little selection to speak of in stage 2. Selection is before and beyond this stage. Hence stage 2 is the most complete group. Stage 2 loses some of its high IQ's to the senior high when grades 4–9 only are used. While the effects of this selection cannot be prevented and it is frankly recognized that this will cause to a greater or less degree a skewing of results, this effect has so far as possible been taken into account in drawing conclusions.

b. Per cent of Children Enrolled in the Study

It would, of course, be ideal in a study of school children to secure material for every child enrolled in the system; but in a study of this sort in which practically every item is secured through the courtesy of those in charge, a hundred per cent return could never be expected. The question naturally arises: Is the number of children included in the study sufficient to warrant the drawing of any conclusions as to conditions shown by that school? Table I presents this situation. The records from the elementary schools were not as complete as were those from the junior and the senior high schools. Material from one of the outlying schools was not sent in, and the loss not discovered until too late to remedy the matter. That accounts for the low percentage of children in the study for the sixth grade. The drop for boys in the twelfth grade was due to boys who had graduated and dispersed before their physiological age had been determined. This is possible, of course, in a school promoting semi-yearly. At least 80 per cent of the boys and girls in each grade of the junior high school were examined.

No child has been included in this study for whom physiological

TABLE I

PER CENT OF CHILDREN IN EACH STAGE OF THOSE ENROLLED IN THE STUDY

GRADE	ON ROLL	IN STUDY	PER CENT	STAGE 1		STAGE 1+		STAGE 2		STAGE 3	
				NO.	%	NO.	%	NO.	%	NO.	%
4—Boys	485	265	55	127	48	111	42	25	09	2	01
Girls	510	328	64	230	70	...	...	91	28	7	02
5—Boys	536	272	51	92	34	117	43	54	20	9	03
Girls	559	454	81	212	47	...	...	196	43	46	10
6—Boys	418	100	24	18	18	42	42	35	35	5	05
Girls	442	171	38	46	27	...	...	84	49	41	24
7—Boys	463	384	83	30	08	164	43	143	37	47	12
Girls	455	366	81	32	09	...	...	176	48	158	43
8—Boys	332	275	83	7	03	61	22	127	46	80	29
Girls	332	286	87	5	02	...	...	94	32	187	66
9—Boys	268	209	80	8	04	20	10	70	33	111	53
Girls	265	226	86	0	00	...	...	28	12	198	88
10—Boys	212	167	80	2	01	3	02	19	11	143	86
Girls	208	187	90	0	00	...	...	3	02	184	98
11—Boys	167	151	90	0	00	2	01	11	08	138	91
Girls	188	176	93	0	00	...	...	2	01	174	99
12—Boys	81	53	65	0	00	0	00	1	02	52	98
Girls	118	101	88	0	00	...	...	0	00	101	100
Total—											
Boys	2962	1876	62	284	15	520	28	485	26	587	31
Girls	3077	2295	75	525	23	...	...	674	29	1096	48

stage was not secured. Even if all other material was at hand, a child was dropped if the doctors had not examined him in order to determine his stage of maturity. 1876 boys and 2294 girls, a total of 4170 children, were so examined and included in the study. These numbers are large enough to be worth working with, and the percent of enrollment is high enough to be a fair sample of the system, except for the sixth grade.

7. *Method of Collecting Data*

a. *The Arrangements of the Leaflets*

In order that the material wanted might be collected with as little trouble as possible for those concerned with giving it and with a minimum chance of error, leaflets were made like the sample given in Figure I. Pages 1 and 4 were clipped on to the sides of a heavy manila cover. Pages 2 and 3 were fastened to 1 and 4 at the edges nearer the center of the cover. This enabled a teacher to write in the names of pupils in her classes up to the number of 78 or to use one side for boys and one for girls, as most

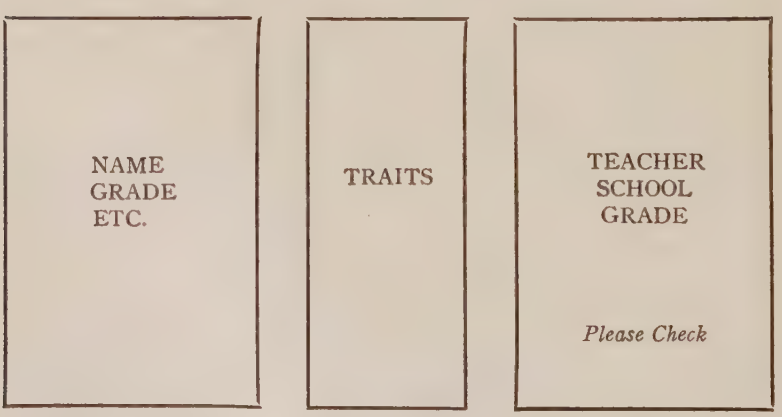

FIGURE 1. ARRANGEMENT OF THE LEAFLETS

NAME	Grade	Age last birthday	Father's Nationality	

Figure 1 (Continued) pages 1 and 4

| | | |

TEACHER SCHOOL

GRADE

Please check characteristics as you notice them in the children. If the same trait appears frequently in a child, check it twice. Just before these papers are collected—in a few weeks—place *O* in any space in which, as far as you can tell, a characteristic is *conspicuously* lacking. For instance: Suppose you notice that James (or Jenny) is always with a gang, either as leader or follower, noisy or quiet. At noon he is one of a bunch squabbling in a corner or loudly proclaiming the virtues of this or that brand of baseball or car or something. You don't find him alone. He is conspicuously gregarious. Therefore you would check James under gregariousness—probably check him twice. Suppose, on the other hand, you notice that George (or Sarah) is always by himself—not wistfully watching the groups, but more or less happily about his own business—studies alone, is identified with no groups, and yet is not a disliked boy, who is alone because the others will have none of him. He and the others are merely indifferent to each other. To George you would give an *O* under *Gregariousness.* Besides James and George there would be many children in whom the trait is, so far as they have shown it to you, neither conspicuously lacking nor conspicuously present. These will have no mark opposite their names under this head. This is to be expected.

Again: Children do not need to roam the country in order to explore. Intellectual curiosity is a form of exploring; and the child who examines his classroom and finds its possibilities in squeaks and rattles is probably qualifying for a check under *Exploration.*

If the children are all of one grade, that fact need only be recorded once, preferably after the name of the teacher on this sheet. Any variation in grade should be noted as well as age last birthday in order to identify the child when this record is combined with his other records.

SAMPLE OF FINISHED RECORD

G	A	F	NAME	CHARACTERISTICS							
				1	2	3	4	5	6	7	Etc.
7	13	Native	Smith, James		*		*		0		
8	14	Russia	Ivor, Mary	**	*		*				
8	11	Germany	Stein, John	*							
7	12	France	Petit, Jeanne		0		0				
		Etc.									

Figure 1 (Continued) page 5

of them did. The one list of names served for the information on both pages 1 and 2. The material called for on page 1 could be filled in at any time and so disposed of under page 2, leaving leaving the material on page 2 easily at hand. The heavy manila cover kept the papers smooth and in a good condition, a desirable item in making reports less annoying to those having them to make.

After the leaflets were planned, but before they were given to the New Britain teachers, they were tried out on two teachers not connected with the New Britain schools. These teachers offered suggestions as to the arrangement and to the time of giving out the leaflets. It was decided that it was best to give the books to the New Britain teachers about the first part of November; they would then be beginning to know their children fairly well. The leaflets were to be collected again early in January—after the Christmas holidays and before the commotion of the ending of a term.

The teachers themselves were given as little as possible to do. They were asked to write the names and nationality, grade, and age last birthday of their pupils merely to insure the identifying of them when the rest of the records were made. The teachers were also asked to record the traits—which will be spoken of later —but that recording was done merely by checking in the appropriate place. Every effort was made to have the make-up of the leaflets clear, with as little writing as possible, and hence with fewer mistakes and less distaste for the job.

When the leaflets came in, the material was entered on a master chart which itself partly sorted the data, taking care of sex, grade, and physiological age. This facilitated the securing of other distributions since physiological age and sex are items in every distribution in this study. A preliminary investigation of the same sort, dealing with children in certain Philadelphia schools was made to test procedure (recorded in the Schoolmen's Week Proceedings (17) for 1926), but the numbers were too small when the children were grouped to permit any conclusions as to procedure in the larger investigation being drawn.

b. Transferring of School Records

All items other than those mentioned were transferred to the

leaflets from the school records by competent persons secured for that purpose. The transferring of the items for the Center Junior High was done by the head of the office force of that school; that of the Elihu Burritt by the teacher in charge of the commercial department; that of the senior high by two girls selected by the person in charge of the testing for the schools, who supervised them in their transferring of the items from the school records to the leaflets. Physiological age and height for all schools came from the health cards in the physicians' office, and were transferred by persons selected by the physician for the girls and superintended by her. The grade school records were transcribed by two grade school teachers, who visited the various schools and got the required information from the children's individual cards. In every case the transferring was done by persons who knew the records, who knew how and where they had been made, who had helped in the making and taking care of them, and who were apparently interested in or anxious to do the work. They voluntarily sent in word of what was going on, and if something came up that seemed uncared for, they wrote about it in order that all might be going well. Before the matter was mentioned to the teachers, there was a meeting with the superintendent and the principals. The ins and the outs of the matter were thoroughly discussed. The high school principal wished individual slips that the teachers in his school might check as they met the children in class. He asked for this on the grounds that the classroom teachers could get the material more successfully than the home room teachers who met their groups for only a few minutes daily. The teacher checked the trait exhibited and sent the slip on to the office at the end of the class period. The office force kept these things up to date. Duplicates of this material were kept by the senior high school principal. He evidently thought the information sufficiently correct to be of value to his school.

c. The Items Secured

The items requested for each child were as follows:

1. Grade in school in the fall of 1925, entered on the record by the person teaching the child.

2. Chronological age. The teacher recorded merely the age last birthday for the purposes of identification. From the records of the school was transferred the date of birth. Chronological age was computed from the date of birth to February 1st, 1926—the mid date for the physiological examinations.

3. The nationality of the child's father. This was recorded by the teacher. Jewish children, of whom there were very few, were labeled "Jew" and so not confused with Russian Catholics or other nationalities as they would have been had mere birthplace of the father been noted.

4. Mental age. The mental age and the test used in securing it and the date of the test were transferred from the school records.

5. The IQ was transferred whenever it was given on the school records. Where only mental age was given, IQ was computed from the mental age and chronological age at the time of the mental test.

6. Date and name of the mental test given were transferred from the pupils' cards.

7. School marks. These were transferred from school records for all subjects for the senior and the junior high schools. The average mark was computed later on. The grade schools had only the final term mark transferred.

8. "Adolescent traits". The traits were selected after a careful study of current books on adolescents with a view to examining those characteristics of boys and girls that have commonly been talked about as typical of adolescents. They are traits that are said to "appear" at adolescence. They are also traits that might possibly be exhibited conspicuously and so recorded when they are shown. All discussion of these traits, including the method of recording them, is deferred to Chapter IV.

9. Height in inches and quarter inches. This was taken by the physicians in gymnasium periods and transferred from the health cards. (Not used here.)

10. Stage of Maturity was determined by the school doctors in accordance with criteria which were secured in the following manner: A list of criteria was compiled from a study of those used by Crampton, Baldwin, et al. The list was submitted to a number of authorities for suggestions and criticisms. The criteria

are those that are generally accepted by the more recent investigators in this field. They were discussed with the New Britain school physicians before they were used and again after the doctors had been working with them for a few weeks in order to find out which items among those on the list were the best for use under the circumstances. The criteria in their final form with the comments of the doctors using them follow:

PERIODS OF PHYSIOLOGICAL MATURITY

(1) 1. Pre-pubescent—immature
2. Probably pubescent, but possibly pre-pubescent
(2) 3. Pubescent—maturing
4. Probably pubescent, but possibly post-pubescent
(3) 5. Post-pubescent—mature (not adult)

EVIDENCES TO BE TAKEN INTO CONSIDERATION IN DETERMINING PHYSIOLOGICAL MATURITY

Boys

(1) Pre-pubescent—immature
Lack of evidence of characteristics listed under (2)
(2) Pubescent—maturing
*a. Appearance of pubic hair and slight pigmentation of same
b. Beginning of period of rapid growth in height and weight
*c. Evidence of second molar teeth erupting
d. Enlargement of genitals
d hard to get and hard to tell stage
teeth and hair considered stage 2
evidences of teeth alone considered 1+
(3) Post-pubescent—mature
*a. Pigmentation and curl of pubic hair. Abundance of pubic hair. Appearance of beard
b. End or near end of period of rapid growth in height and weight.
Can't tell b
*c. Second molar teeth erupted
c always considered stage 3

---

* Means that the criteria were those considered best for use in a school examination. Comments in italics were made by the physician checking the criteria.

d. Full development of larynx—change of voice
e. Seminal emissions
Teeth, hair, kink in hair, consider stage 3

GIRLS

(1) Pre-pubescent—immature
Lack of evidence of characteristics listed under 2
No 1+ girls found
(2) Pubescent—maturing
*a. Appearance of pubic hair and slight pigmentation of same
a also axillary
b. Beginning of period of rapid growth in height and weight
b hard to tell
c. Evidence of second molar teeth erupting
d. Enlargement and change of appearance of breasts
e. Enlargement of pelvis breadth
(3) Post-pubescent—matured
*a. Pigmentation and curl of pubic hair
Abundance of hair. Hair under arms
b. End or near end of period of rapid growth in height and weight
b hard to tell
c. Second molar teeth erupted
Not always sign of maturing; used in place of better criteria in case of unknown child
d. Full development of larynx
Can't examine in detail; of no value for girls
*e. Menstruation
Only a very few cases without this could be termed in this class. Appearance of it puts the girl definitely in stage 3

An examination of these shows definitely that the doctors had certain objective signs that they used to determine in which stage the children they examined were to be placed. Another qualified person examining the children would be more or less forced to place them in the same stage of maturity. The criteria are objective and reliable. The stage 1+ noted for the boys was "created" by the physician for the boys. Signs of the eruption of the second molar teeth was listed as one of the second stage criteria. When this appeared alone, with no other sign of maturing, the physician said that in his judgment the boys did not belong to stage 2;

at least he was not willing to place them there without indicating that this was the only sign they possessed. Therefore these boys were labeled 1+. This gives four stages of physiological age for boys and three for girls. See page 37 for the final disposition of the stage 1+ boys.

8. *The Use of a Coefficient*

In utilizing the data, Q, the coefficient of association, has been used constantly in this study as a means of establishing certain trends. Q is not one of the commonly used statistical devices, and for that reason it might be well to describe briefly the basis on which it is computed. Yule (22, p. 25) gives this basis in the opening paragraph of Chapter III in his *Introduction to the Theory of Statistics*. "If", he writes, "there is no sort of relationship of any kind between two attributes, A and B, we expect to find the same proportion of A's among the B's as amongst the non-B's. We many anticipate, for instance, the same proportion of abnormally wet seasons in leap year as in ordinary years, the same proportion of male to total births when the moon is waxing as when it is waning, the same proportion of heads whether a coin is tossed with the right hand or with the left."

Yule uses a certain literal symbolism to express this statement that needs explaining because, unless one is used to it, he is likely to confuse it with the very similar algebraic symbols familiar to all. When Yule wishes to express all individual possessing trait A, he writes it thus: (A). If the individuals possess traits A and B, both of them, he writes it thus: (AB). This does not mean the algebraic product of A and B; it has nothing to do with A times B; it means merely individuals possessing both traits A and B. The Greek letters are used to signify the absence of a trait. Hence (α) means those not possessing A and (β) those not possessing B; (Aβ) those possessing A but not B, etc. If this terminology is applied to a proportion dealing with brown eyes and brown clothes, A would represent the number of persons with brown eyes; B the number of persons wearing brown clothes; β, persons wearing other colored clothes. No relationship betweein the traits brown eyes and brown clothes requires the per cent of persons having brown eyes to be

the same among those wearing brown clothes and among those wearing other colored clothes. The equality would appear:

$$\frac{(AB)}{(B)} = \frac{(A\beta)}{(\beta)}$$

If there *is* relationship, however, between having brown eyes and wearing brown clothes, the per cent of brown-eyed persons we aring brown clothes would be greater than the per cent of brown-eyed persons wearing clothes of other colors, and the inequality would be written in this way:

$$\frac{(AB)}{(B)} > \frac{(A\beta)}{(\beta)}$$

This method of finding relationships between factors requires the division of material into two classes—those who have a trait (brown eyes) and those who do not; those who wear brown clothes and those who do not. There is no gradation, no attempt at correlation. Q, the coefficient of association, tries to answer the question: Is there a relationship between having brown eyes and wearing brown clothes. Q answers "Yes" or "Yes indeed" according to the size of Q. The coefficient of correlation, r, tries to answer the question: To what extent does a change in the pigmentation of the eyes affect the selection of colors in clothes.

Q, then, to repeat, compares the frequency of the appearance of a trait in the presence of another factor with its frequency in the absence of the factor. If the proportions are the same, the trait is assumed to be independent of the other factor; if they are not the same, the trait is assumed to be associated with the presence or else with the absence of the factor.

The actual finding of the coefficient of association, Q, is done by means of a formula devised by Yule, which is built up out of the expression of independence given above. The deriving of that formula is given in his *Theory of Statistics* (22, p. 38). The formula itself is:

$$Q = \frac{(AB)(\alpha\beta) - (A\beta)(\alpha B)}{(AB)(\alpha\beta) + (A\beta)(\alpha B)}$$

The four-fold table for deriving values for these quantities can be filled in easily once the totals and the AB are secured. For example:

Let A be the number of persons with brown eyes 10
Let α be the number of persons with light eyes.. 15
Let B be the number of persons wearing brown clothes 8
Let β be the number of persons wearing other colors 17
Let AB be the number of brown-eyed persons wearing brown clothes..... 7

	A	α	T
B	7	1	8
β	3	14	17
T	10	15	25

By filling in the totals, one can obtain all the values needed for the formula Q.

The formula for the standard error of Q can be found in Yule's explanation of Q given in an article in the Philosophical Transactions of the Royal Society of London (23, p. 197).

Where Q has been recorded as plus or minus in this study, the value of Q has exceeded five times this standard error found for the value of Q in question. No association has been recorded in the summaries unless its significance has been so proven.

9. *Summary of Chapter I—The Problem*

Because of the dearth of studies on physiological maturity, any attempt to work in the field looms large in importance. Frequently it has been hard to evaluate (and often hard to use after evaluating) the findings of other investigations because important criteria (for judging maturing, for instance) have been omitted. For this reason, in this study especial care has gone into the mechanics of selecting the items to be used and of collecting the data. It is to be hoped that the results will prove of value to those interested in the subject of how boys and girls grow up.

II

How Boys and Girls Mature by Stage

1. *Distribution According to Chronological Age*

The first question in connection with children's growing up is—when do they begin? Table II gives the distributions according to chronological age for each stage. Particularly noticeable is the wide range of chronological age covered by children of each stage. From the age of 10 up to 15 for boys and up to 14 for girls there are children of all three stages at every age.[1]

The percentages of stage 2 (pubescent) and stage 3 (post-pubescent) are quite different from those given by Koos (16 p. 66) in his tables. See Figure 2. The percentages of the New Britain boys of each age who are in Stage 2 are consistently higher than those given by Koos, and using the Stage 1+ boys along with stage 2 makes the number of immature at any stage still smaller than that shown by the other figures. Apparently signs of teeth alone have not been considered Stage 2 by the other investigators, but the position of their curve between those of stages 1 and 2 warrants their being so considered. It is noticeable that the New Britain data put the age of maturing much earlier, on the whole, than do the data of Baldwin and Crampton. It is also noticeable that there is less difference between the curves of the boys and the girls in the New Britain data than between those of the others. It is interesting to notice, however, how closely the curve of the stage 3 boys follows Crampton's curve (Koos used Crampton (2) for the boys and Baldwin (3) for the girls). That

[1] The question arises regarding where the stage 1+ boys belong, whether they belong in stage 1 or stage 2. Since the percentage of stage 1 boys disappears first, stage 1+ next, and stage 2 last, as the children advance in chronological age, it looks as if stage 1+ is truly an intermediate stage between stages 1 and 2, and hence, since it is not 1, belongs with 2. The intermediate position comes out also in connection with the distribution according to grade (page 56). For this reason, hereafter, stage 1+boys will be classified with stage 2 boys unless a statement is made to the contrary. Grouping the stage 1+ and stage 2 boys makes the curve of the maturing boys strikingly similar to that of the girls.

TABLE II

NUMBER AND PER CENT OF CHILDREN OF EACH STAGE IN EACH CHRONOLOGICAL AGE GROUP

C. A.	9	10	11	12	13	14	15	16	17	18	19	TOTAL
Boys—Stage 1	51	107	66	21	21	13	5	...	...	...	...	284
Per Cent	18	38	23	07	07	05	02	...	...	...	...	
Stage 1+	15	72	103	144	107	57	19	1	1	1	...	520
Per Cent	03	14	19	27	20	11	03	01	01	01	...	
Stage 2	3	7	17	67	147	162	64	15	3	...	...	485
Per Cent	01	02	04	13	30	33	13	03	01	...	...	
Stages 1+ and 2	18	79	120	211	254	219	83	16	4	1	...	1005
Per Cent	01	07	12	21	25	22	08	02	01	01	...	
Stage 3	...	3	2	6	26	118	160	148	68	41	15	587
Per Cent	...	01	01	01	04	20	27	25	12	07	02	
Girls—Stage 1	109	205	133	55	20	3	...	...	...	...	...	525
Per Cent	21	39	25	10	04	01	...	...	...	...	...	
Stage 2	8	65	153	174	176	77	18	1	1	...	...	674
Per Cent	01	09	23	26	26	11	02	01	01	...	...	
Stage 3	...	2	16	60	183	243	210	181	143	43	15	1096
Per Cent	...	01	02	06	18	24	21	18	14	04	02	

for stage 3 girls does not follow Baldwin's curve as nicely as does that of the boys.

CONCLUSIONS

1. The distribution according to chronological age is wide for all stages.
2. Grouping the stage 1+ and stage 2 boys makes the curve of the boys strikingly similar to that of the girls.
3. This study shows fewer immature among school children of 9 years old and up than is found in the reports of other investigators.
4. Maturing starts for some children at what seems to be an extremely early age for both boys and girls.

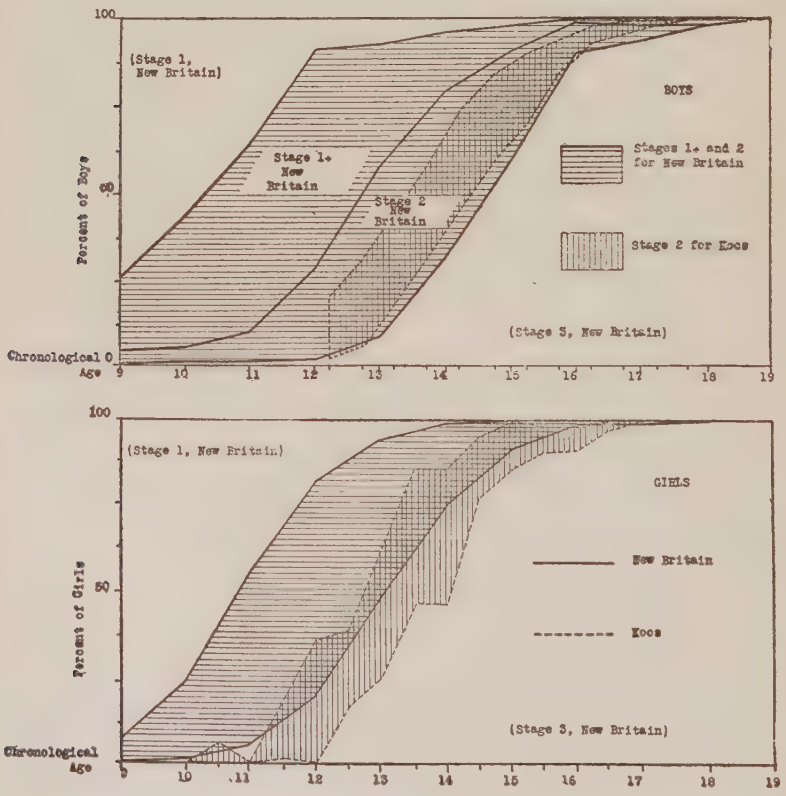

FIGURE 2. PER CENTS OF CHILDREN PUBESCENT AND POST-PUBESCENT ACCORDING TO CHRONOLOGICAL AGE, COMPARED WITH KOOS

TABLE III

Per Cent of Children Immature and Mature at Each Chronological Age

C. A.		9	10	11	12	13	14	15	16	17	18	19	TOTAL
Boys—Stage 1	No.	51	107	66	21	21	13	5	..	..	..	..	284
Immature	Per Cent	74	57	35	09	07	04	02	..	..	..	..	
Stages 1 and 1+	No.	66	179	169	165	128	70	24	1	1	1	..	804
Immature	Per Cent	96	95	90	70	42	20	09	01	02	02	..	
Stage 3	No.	0	3	2	6	26	118	160	148	68	41	15	587
Mature	Per Cent	00	01	01	02	09	34	65	90	94	98	100	
Girls—Stage 1	No.	109	205	133	55	20	3	..	..	..	..	..	525
Immature	Per Cent	93	75	44	19	05	01	..	..	..	..	..	..
Stage 3	No.	0	2	16	60	183	243	210	181	143	43	15	1096
Mature	Per Cent	00	01	05	21	48	75	92	99	99	100	100	

2. *The Normal Age for Maturing*

In the quartiles for the distributions for these curves, shown in Table IV, the position of the 1+ boys as belonging with stage 2 is again made clear. It must be remembered in connection with this study that these children are selected inasmuch as they are school children in grades 4 through 12 only, and not all children of ages 9 through 19. That means that many immature, some maturing, and some mature children of ages 9 and over as well as many younger than 9 will be below the fourth grade or not in the public schools at all and hence not among these included in the study. This selection of the children raises the median age for maturing for stage 1. The dropping out of older children for the same reason lowers the median for stage 3.

TABLE IV

RANGE AND QUARTILES IN CHRONOLOGICAL AGE FOR EACH STAGE OF MATURING

BOYS	LOWER LIMIT	Q_1	MED.	Q_3	UPPER LIMIT
Stage 1.....	9	10.18	10.85	11.83	15
Stage 1+.....	9	11.4	12.5	13.5	18
Stage 2.....	9	13.8	14.0	14.75	17
Stage 1+ and 2.	9	12.16	13.29	14.32	18
Stage 3.....	10	14.93	15.87	16.85	19
GIRLS					
Stage 1.....	9	10.108	10.75	11.6	14
Stage 2.....	9	11.62	12.63	14.38	17
Stage 3.....	10	14.05	15.3	16.59	19

Table IV gives the medians, the quartiles, and the ranges of age for each stage by sex. Certain points are interesting: In the figures for girls, the upper quartile of stage 1, 11.6, coincides with the lower quartile of stage 2, 11.6; likewise, the upper quartile of stage 2, 14.38, slightly overlaps the lower quartile of stage 3, 14.05. There is apparently a certain regularity of development here. This meeting of quartiles does not occur for the boys. The lower quartile of the more mature stage is further advanced—older—than the upper quartile of the next less mature group.

This is not worth much, however, because of the effect of selection on the medians and hence on the quartiles of stages 1 and 3.

The most complete group—the most unselected from the standpoint of chronological age is, of course, the stage 2 children. A comparison of the quartile distributions for these boys and girls gives:

STAGE 2

Boys			Girls		
Range 9——18			Range 9——17		
Q_1	12.16	1.13	Q_1	11.6	1.
M	13.29		M	12.6	
Q_3	14.32	1.03	Q_3	14.38	1.78
Interquartile range 2.16			Interquartile range 2.78		

The difference in range is 1 year.

The difference in interquartile range is .62; the girls take longer than the boys.

The difference in medians is .69; the boys mature later than the girls.

Here is a curious situation. On the assumption that more children are normal than otherwise, can it be assumed that the normal age for maturing children would run somewhere about the limits set by these quartile boundaries, and that the girls take almost three years, usually centering around 11, 12, and 13 for the process; and the boys about two, most commonly around 12 and 13 or 13 and 14? There would be a leeway for normal maturing at both ends, greater for the boys than for the girls, because of the gaps between the quartiles for the boys. The median for the boys is nearer that of the girls than has usually been stated.

The problem of determining the normal age for maturing in boys and girls can be attacked from another standpoint. The work of Baldwin in connection with the age for maturing has shown for his group a positive relationship between high IQ and early maturing. This suggested computing the association between high IQ and chronological age for successive early ages and the association between low IQ and chronological age for successive late ages for each stage. In order to do this, each stage was used separately for each sex. Stage 3 girls, for instance, were distributed according to chronological age for each IQ. For these

third stage girls, then, was found first the association between 9-year-olds and high IQ, next that between 9 and 10-year-olds and high IQ, next that between 9, 10 and 11 years and high IQ, etc.

If the distribution of IQ's and ages is normal, and if Baldwin's contention is true, it is reasonable to expect to find a high association between 9-year-olds and high IQ, between 9 and 10-year-olds and high IQ, etc., a high association between a group of ages and high IQ as long as the ages are in advance of normal age for maturing for that stage. This association would drop when the normal age for maturing is reached. It would have to if there is an association between early maturing and high IQ. In the material of this study, breaks appeared in almost every stage.

The question, of course, arises, could that peculiar break be due to anything else? Is selection playing any part in the association? This material is selected for high IQ and for chronological age in the younger ages. Since the lowest grade in the study is the fourth grade, more low IQ's than high of ages 9, 10, and perhaps 11, and 12 will have missed promotions and have remained in grades two and three, and so not be in the study. This makes the distributions of IQ among our 9-year-olds skew toward the low end. Hence the association between 9-year-olds and high IQ will be high for all stages because of this selection.

But the shortage of low IQ's among the 10-year-olds is less than it is among the 9-year-olds, for 10-year-olds may have missed their grade but still be in the study. The shortage among the 11-year-olds is still less. By the time 12, 13, 14-year-olds are reached, there is a more or less normal distribution of IQ for each chronological age. This shortage of low IQ's, increasing association with high IQ, diminishes more or less regularly from year to year. There is nothing to cause a break of any sort, however to cause a sudden change from higher to lower association.

If there is an association between high IQ and early maturing, then, there are two things working toward an expression of that association in the early years of the material of this study: 1. selection, and 2. early maturing. The high association might be due to 1 or it might be due to 1 and 2. The effect of 1 would be a gradual diminishing of association as the effect of the selection

wore off; the effect of 2 would be a possible gradual diminishing of association with cessation or at least a decided break when the influence of early maturing ceased and the age became normal for maturing for that stage. This break, seeming to confirm the theory of an association between high IQ and early maturing and low IQ and late maturing, is found in almost every case. An example of the procedure for finding what might be considered late maturing among stage 1 girls is given below. The distribution is shown in Table V.

There would be no early maturing girls in stage 1 that one could select, for they would all be stage 2 or else indistinguishable from normal and late maturing in very young children. The coefficients of association, "Q", for late maturing and low IQ are as follows:

No. of stage 1 girls.....475
No. of low IQ's..... 80
No. of late maturing, 14 chronological age and over..... 3
No. of late maturing, low IQ..... 3
Since all late maturing are low IQ, Q is −1.
Consider late maturing as anything over 13 chronological age
No. of late maturing..... 22
No. of late maturing, low IQ..... 12

Finding the value of Q according to the method given by Yule gives:

$$475-80-22+12=385$$
$$80-12=68$$
$$22-12=10$$

$$Q=\frac{12(385)-10(68)}{12(385)+10(68)}=\frac{4620-680}{4620+680}=\frac{3940}{5300}=.743$$

Consider late maturing as anything over 12 chronological age.
No. of late maturing.....72
No. of late maturing low IQ.....28
Q for this association is .765
Considering late maturing as anything over 11 gives for Q, .615

TABLE V

STAGE 1 GIRLS GROUPED ACCORDING TO CHRONOLOGICAL AGE AND INTELLIGENCE

C. A.	HIGH IQ	NORMAL IQ	LOW IQ	TOTAL
9	42	48	2	92
10	49	115	22	186
11	25	72	28	125
12	10	24	16	50
13	..	10	9	19
14	..	..	3	3
15	..	..	..	...
Total....	126	269	80	475

In this same way figures for the coefficients of association of high IQ and early maturing and low IQ and late maturing were found for each stage of maturing for boys and for girls. The results are given in Table VI.

TABLE VI

VALUES OF "Q" FOR ASSOCIATIONS BETWEEN IQ AND TYPES OF MATURING

TYPE	C. A.	STAGE 1		STAGE 2		STAGE 3	
	UNDER	BOYS NO. 204	GIRLS NO. 475	BOYS NO. 893	GIRLS NO. 422	BOYS NO. 518	GIRLS NO. 1004
Early maturing and high IQ	9	cannot be determined		.57	.50		
	10			.28	.34		
	11			.04	.19		.085
	12				.43	.28	.46
	13					.34	.24
	14					.03	.207
	15					.68	
	OVER						
Late maturing and low IQ	16			.37			
	15	.30	none	.24	.62	cannot be determined	
	14	.66	1.	.19	.19		
	13	.51	.743		.197		
	12	.53	.765		.304		
	11	.47	.615				
	10		.84				

This gives the ages for normal maturing shown in Figure 3. Obviously the late maturing in stage 3 cannot be detected any more than can the early maturing in stage 1; it is equally obvious that "normal" maturing contains many early and many late maturing as well. But this procedure cuts out the early and the late maturing to some degree, so that their influence is materially reduced among the normal maturing and renders early and late maturing children fairly free from other influences. While one cannot base conclusions as to individual children on group results of this sort, the aspect of the graphs suggests that girls mature more or less uniformly, taking about three years for the process, while boys differ greatly among themselves as well as from the girls, ranging from two to four years for the time required for them to mature. Perhaps this shorter time accounts for the gaps between the quartile limits noticed before. (See Table IV).

If one objects to this method of finding the ages of normal maturing on the grounds that the evidence in favor of the association of the two traits is by no means proven (see page 18 and page 51), he can, at any rate, work on the assumption that the ages for normal maturing given in this section allow a fair spread for deviation on each side of the median and that the years for early and late maturing as given here mark at least noticeable deviations from the norm.

CONCLUSIONS

There is a striking difference between the boys and girls in the time they take for maturing. The girls mature more or less uniformly, taking about three years for the process; the boys differ greatly from the girls and also differ among themselves as well, taking from two to four years for the time required to mature.

3. *Earlier Maturing and IQ*

Baldwin makes the statement that the earlier maturing children are of the higher IQ. He compared the mean mental ages of the different chronological age groups for physically accelerated and for physically retarded children. He found the accelerated children higher in mean mental age for each age than he found the retarded (except for chronological age 13 for girls).

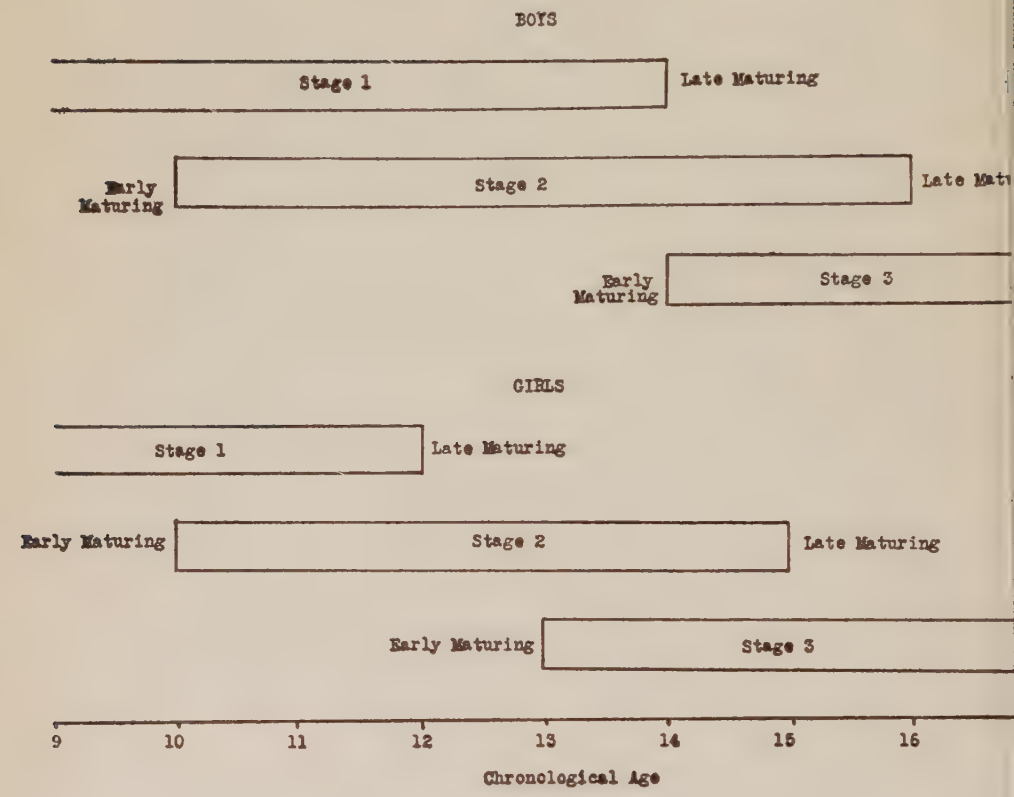

FIGURE 3. NORMAL AGE FOR MATURING

Boys	*Age*
Early Maturing	Stage 2, 9 and under
	Stage 3, 13 and under
Normal Maturing	Stage 2, 10–15 inclusive
Late Maturing	Stage 1, 14 and over
	Stage 2, 16 and over

Girls	*Age*
Early Maturing	Stage 2, 9 and under
	Stage 3, 12 and under
Normal Maturing	Stage 2, 10–14 inclusive
Late Maturing	Stage 1, 12 and over
	Stage 2, 15 and over.

Assuming that these physically accelerated children were also physiologically accelerated, he concluded that the more mature at any age are of higher IQ than are those in earlier stages of physiological development.

What do these children show in this respect? They are grouped according to chronological age and then according to IQ, high, normal, and low. The percentage of each stage at each age that falls in each type of IQ gives the clue as to whether the earlier maturing are of the higher IQ.[2]

Table VII shows the results of this. Those percentages conforming to Baldwin's findings are encircled.

For instance, for girls of 9 years, there is a smaller percentage of the high IQ and a larger percentage of the low IQ in the second stage than in the first. That is, the more mature child at 9 chronological age appeared less frequently among children of high IQ and more frequently among the children of low IQ. Earlier maturing and higher IQ are not associated, then, at the 9-year-olds chronological age limit. At the 10-year-old level, the figures show that of the high IQ's, 33 per cent are in the second stage and only 26 per cent in the first. In other words, the more mature children, i.e., those maturing earlier, had a larger percentage of high IQ children in their group than had the less mature. The percentages for the low IQ's for 10-year-olds do not agree with this theory of the association between earlier maturing and high IQ. At the 10-years level, 50 per cent of the low IQ's fall in the most mature group, stage 3, which is of course, earlier maturing than stage 2 or stage 1 at this age. This material does not agree with Baldwin's on this point. Baldwin's one exception to the rule that the earlier maturing child was of high IQ was in the case of 13-year-old girls. These show definitely that among the 13-year-olds the high IQ's appear in a larger percentage among the earlier maturing children.

The percentages of this study do not consistently run as Baldwin's did and show that the higher IQ's at any age belong to the earlier maturing children. For the girls it is shown 15 times and

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[2] Note there is a difference between earlier and early maturing. The two are not necessarily the same.

TABLE VII

PER CENT OF EACH STAGE FOR EACH IQ ACCORDING TO CHRONOLOGICAL AGE

		C. A.	9	10	11	12	13	14	15	16	TOTAL
GIRLS	High IQ	Stage 1	46	(26)	21	(20)	(00)	(00)			27
		2	43	(33)	(17)	(23)	(10)	(07)			17
		3			(27)	(36)	(14)	(11)	07	07	13
	Normal IQ	1	52	63	57	48	53				57
		2	43	56	57	45	61	60	38		55
		3		50	66	45	68	63	53	34	59
	Low IQ	1	02	11	22	32	(47)	(100)			16
		2	14	11	26	(32)	(29)	(33)	(62)	(100)	28
		3		50	27	(19)	(18)	(36)	(40)	(59)	28
BOYS	High IQ	1	36	21	28	(51)	(10)				23
		1+	32	21	14	(31)	(21)	(12)	25		22
		2	25	22	12	(19)	(24)	(17)	10	(00)	19
		3				(50)	10	12	07	(12)	11
	Normal IQ	1	43	67	58	65	57	88			59
		1+	32	50	53	48	66	72	75		54
		2	50	22	30	36	52	70	73	100	54
		3	100	100	50	25	26	57	63	88	56
	Low IQ	1	21	12	14	(30)	(33)	12			18
		1+	(36)	29	33	(21)	(13)	(16)			24
		2	(25)	56	(58)	(45)	24	(13)	17		27
		3			(50)	(25)	64	31	30		33

Those per cents in parentheses conform to the findings of Baldwin and show that in these cases the more mature at any age are of higher IQ than are those in an earlier stage of physiological development.

not shown 9 times; that is in 62 per cent of the cases, the data support Baldwin's findings. In the case of the boys, there is a different story: it is shown 12 times and not shown 22 times; that is in 35 per cent of the cases, Baldwin's findings are supported by this material.

CONCLUSIONS

The relationship between earlier maturing and higher IQ is by no means definitely shown.

4. *The Effect of Nationality*

Whenever one considers the matter of differences between people, the question of the effect of nationality always thrusts itself into the situation and, like the proverbial monkey-wrench, causes confusion. It does this here. Do children of southern extraction, Italians, for instance, mature earlier than do those of northern, Scandinavians, for instance? The groups in this study are, of course, selected groups, that is those Italians and Scandinavians who are of school age and who attend our schools. They have had American food, American climate, American medical attention, as furnished by the schools, American conditions generally to influence them. They are not truly foreign even if their homes *are* in foreign sections and their home language *is* other than English. They are, however, foreign children as American schools get them—the kind American schools have to deal with and provide for. For this reason, while the results of this study may not be at all true of Italian children in Italy or of Scandinavian children in Sweden, they are of practical value as findings in regard to Italian and Scandinavian children as American schools are likely to encounter them in a city of this type.

Since the maturing or second stage group is the most complete group (see page 43) and for that reason the quartiles and medians mean much more than do those for the other stages, the quartile distributions of maturing children for six different nationalities have been listed in order to determine what differences between the different nationalities exist in respect to age of maturing. Table VIII gives this.

Although there is a real difference between the highest and the

lowest medians of maturing, one beyond the probable error of sampling, six months for the girls and eight for the boys, it is not great enough in light of the great overlapping between races to affect in any significant way the conclusions one might wish to draw concerning the age of maturing.

An interesting aspect of the question comes up in connection with the sex differences in the age of maturing for the different nationalities. In every case, of course, the median for the girls is lower than that for the boys, but the difference is greater in some nationalities than it is in others. This is also shown in Table VIII. Native and German boys and girls are farther apart than are the boys and girls of any other nationality. This might possibly be worth considering in grouping if homogeneity of maturity were desirable. Native girls are about a year ahead of the boys; Central European girls only about four months. But, practically, the difference between nationalities in this respect is too small to affect results in this study to any great extent.

In the matter of range, stage 2 girls cover a range of from five to eight years; boys run from five to nine years. The German boys and girls have the shortest range and the native boys and girls the longest. But, for the purposes of this study, it is hardly necessary to consider nationality in its effect on maturing in these school children.

CONCLUSIONS

1. There is little difference, only about seven months, between the highest and the lowest median ages for maturing for the different nationalities.
2. The differences between the boys and the girls in the age of maturing of the different nationalities are large enough to be worth considering in a comparison of boys and girls.
3. On the whole, however, it is hardly necessary to consider nationality as a factor sufficiently disturbing to invalidate the results of this study.

5. *Summary of Chapter II—How Boys and Girls Mature Stage by Stage*

What has come out most clearly so far is the fact that every phase of maturing examined in this part of the study emphasizes differences—differences in range for different stages and different

TABLE VIII

QUARTILES OF MATURING CHILDREN DISTRIBUTED FOR CHRONOLOGICAL AGE ACCORDING TO NATIONALITY

		NO.	LOWER LIMIT	Q_1	MED.	RANK	Q_3	UPPER LIMIT	FOR MEDIANS DIFFERENCE BETWEEN SEXES	RANK
Native	Boys	198	9	12.52	13.7	1	14.91	18	1.01	2
	Girls	105	9	11.75	12.69	3	13.62	17		
Scandinavian	Boys	66	9	12.29	13.66	2	14.57	16	.80	3
	Girls	36	10	11.66	12.86	2	13.72	16		
German	Boys	60	10	12.82	13.59	3	14.35	15	1.02	1
	Girls	51	10	11.63	12.57	5	13.80	15		
Polish	Boys	124	9	12.23	13.39	4	14.45	17	.49	5
	Girls	160	9	11.87	12.9	1	13.64	15		
Italian	Boys	146	9	11.65	13.08	5	14.01	16	.74	4
	Girls	91	9	11.47	12.34	6	13.36	15		
Central Europe	Boys	171	9	11.85	12.98	6	14.07	16	.33	6
	Girls	84	9	11.61	12.65	4	13.59	15		
	Boys			Difference between highest and lowest		.72			Difference between highest and lowest	.69
	Girls					.56				

sexes—differences in normal age of maturing—differences in kind of maturing—differences in IQ in connection with maturing—and, to some extent, differences in nationality. The most far-reaching of these differences is the one between boys and girls in the age of maturing; and the question of how long it takes a child to mature brought to the fore by the graphs of the boys and girls on page 48 is surely the next question to be answered. That, of course, can only be done by patient study of many individuals over many years. Such a study, started by Baldwin, is being carried on, but it is too soon for results of any magnitude to be reported.

What seems to have been established in this investigation of New Britain school children are certain words of warning:

1. Be careful in speaking of "children"; they are boys and girls—two separate individuals.
2. Be careful of grouping boys and girls according to senior high, or junior high, or elementary, or even primary schools. Their grade in school is apparently almost the only thing they have in common.
3. Keep track of stage and type of maturing; either or both may be disturbing factors in an otherwise satisfactory situation.

III

How Boys and Girls Progress Through School Stage by Stage

1. *Distribution According to Maturity for School and by Grade*

There are more girls than boys available for the purpose of this study, but the percents in the different stages of maturity are not so uneven as to preclude comparison of the two groups in the same study.

Figure 4 gives the distribution of physiological age according to sex and grade (See Table I). The difference between the boys and the girls is marked. It is interesting to note that in every grade from the fourth to the twelfth, except the twelfth for girls, there are children of at least two stages of physiological maturity, and that in every grade through the eighth there are children of all three stages.

When this distribution given in Figure 4 is compared with that given by Koos in his *American Secondary School*, quite a difference in the per cent of immature at each grade is evident. Koos took the per cent of children immature (pre-pubescent), maturing (pubescent), and mature (post-pubescent) at each chronological age as given by Crampton for boys and by Baldwin for girls, and applied that percentage to the number of children of each age given in each grade of an age-grade table for certain school systems in Minnesota. In that way he estimated a percentage of each stage in each grade. Koos's curve is a computed curve, while the curve for New Britain is the curve of the actual distribution of the children in the school system. The position of the 1+ boys is interesting. No 1+ girls were noticed by the physician for the girls; all showing signs of teeth showed other signs of maturing as well. It is possible that below the fourth grade some curve corresponding to that of the 1+ boys might have been discovered for the girls. The age-grade table for the New Britain children shows more overageness in the 4th, 5th, and 6th grades and less from the 7th grade on than does an average of 800 (20 p. 17)

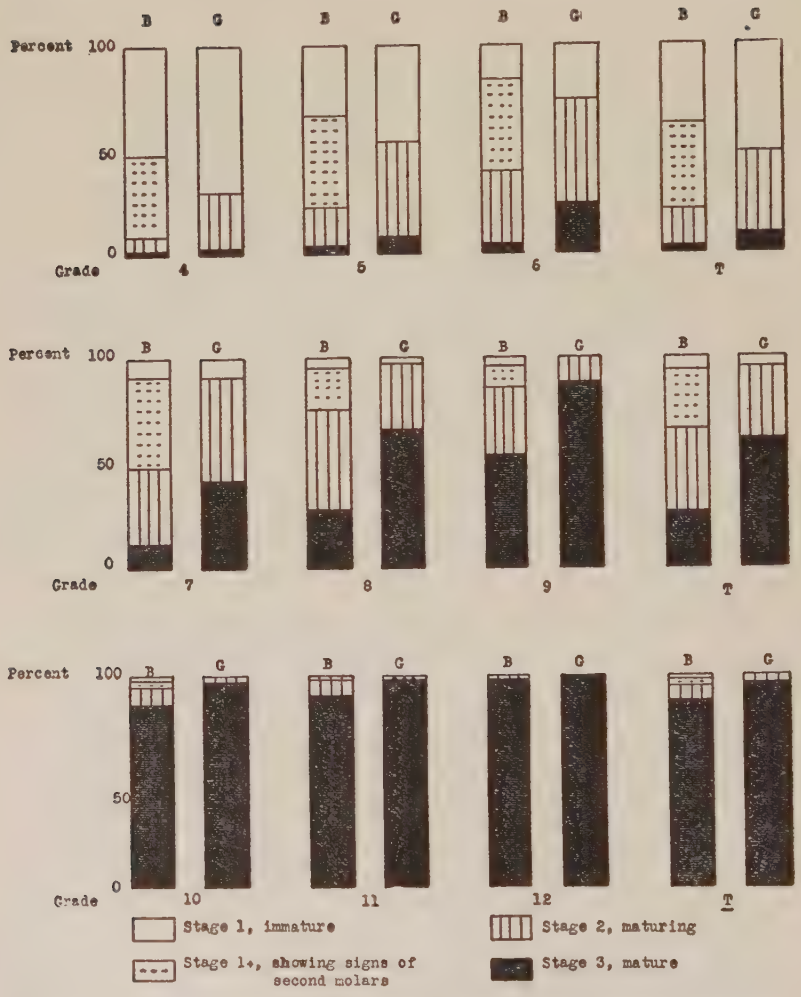

FIGURE 4. DISTRIBUTION OF CHILDREN ACCORDING TO GRADE, SEX, AND PHYSIOLOGICAL MATURITY

cities. According to Koos, more overageness would raise the per cents of mature and maturing children in each grade. This is so here. See Figure 5.

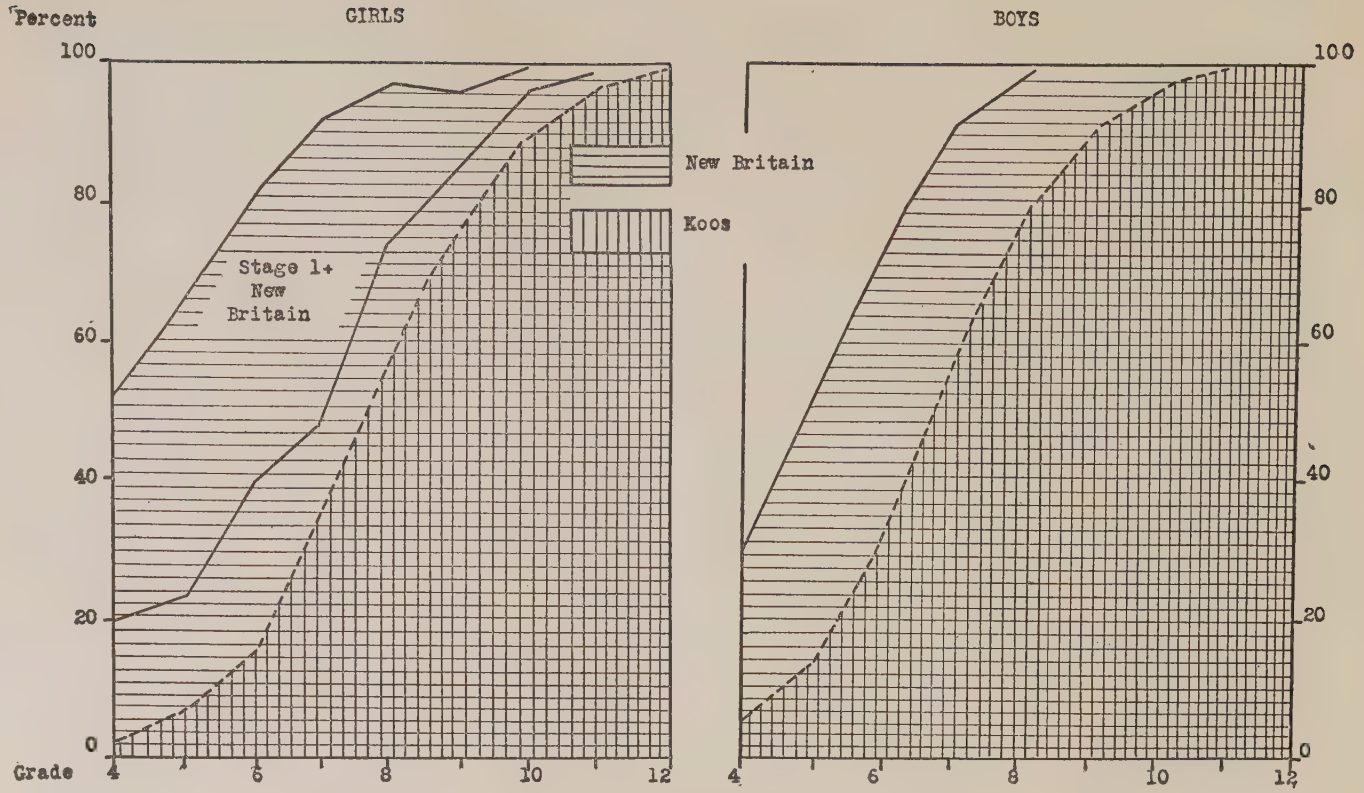

FIGURE 5. PER CENTS OF PUBESCENT AND POST-PUBESCENT CHILDREN IN EACH GRADE COMPARED WITH KOOS'S FIGURE

CONCLUSIONS

In spite of their distribution, there is a fair proportion of all three stages of maturity in this school system. Children of each stage are distributed widely throughout the grades 4–12. All three stages for boys appear in each grade through the 10th grade and for girls through the 8th grade, grade 12 for girls being the only grade in which children of one stage only appear.

2. *Age-Grade Distributions*

It is a question whether age for grade has much significance if all the things, irrelevant to the type of child are considered; there is much that might push him ahead or put him behind his normal grade in school: a birthday a few months too late in a district that enforced the six-year limit; a change in school, measles, or a broken leg; a school admitting younger children than other schools admit; home tutoring. It is interesting, however, to examine an age-grade table arranged according to the different stages of maturity of the children in the school.[1] Table IX.

It is generally assumed that being underage for grade is an advantage from one point of view of another. It certainly means that one is progressing satisfactorily according to academic standards. Generally these underage children are assumed to be brighter than the others; and the brighter children and the early maturing children are frequently highly associated according to some findings In this way underage and early maturing may be tinted with the same color, that of high IQ. In the same way, overage, low IQ and late maturing may overlap. This does not, however, prevent the recognition of certain items that stand out in connection with age-for-grade situations.

Consider the early maturing children. Are they really in a larger proportion in the underage group than they are in any other?

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[1] The age-grade table, Table IX, inserted here is an ordinary chronological age-grade table, showing the children used in this study. The children in each division of the table are separated, however, according to physiological stage. The dark line, as usual, represents the limits for those in the Normal age for grade group. Those children below the normal group are overage and those above underage. Thus, by referring to the totals, which are themselves divided according to physiological age, one can easily obtain the percent of children of any stage in any age-grade group.

If so, then early maturity is an advantage to a child—if underage for grade is an advantage. What of the late maturing? Are they to be congratulated or commiserated? Table X gives data which may help to answer the question. The bases for the percentages are the total numbers of children in each age-grade division. Among the underage for grade boys, 5 per cent of their number are early maturing and only 1 per cent late maturing. In the case of the girls, the same thing holds true: among the underage for grade girls, 8 per cent are early maturing and only 1 per cent late. Among the overage for grade boys, less than .2 per cent are early and 3 per cent are late. Among the girls, 3 per cent are early and 11 per cent late. In other words, the early maturing and the underage fall together, the late maturing and the overage The percentages for the boys show a less pronounced relationship than do those for the girls. This is to be remembered in connection with all comparisons between the boys and the girls.

But are the high IQ, early maturing children always the ones who progress most rapidly? How do high IQ, early maturing, compare with high IQ, late maturing as to underageness? In other words, is early maturing in itself an advantage? Table XI gives this material, using for bases for the percentages the total numbers of children in each type of maturing Among the high IQ, early maturing girls, 35 per cent are underage and none overage. Among the high IQ, early maturing boys, 25 per cent are underage and none overage. The same tendency is present. Early maturing *does* go with underageness.

It might be, of course, that chronological age is influencing the results unduly. To eliminate this influence, the overage and underage for different types of maturing must be compared for some one age, 12-year-old, high IQ girls, for instance. Table XII in which the bases for percentages are again the types of maturing, shows that early maturing and underageness *do* run together inasmuch as 47 per cent of the early maturing are underage and none overage for grade.

However, cutting out factors in this way has presented another difficulty. The early maturing individuals are all third stage or mature children and older chronologically, the normally maturing, second stage, and the late maturing, first stage. This dilemma is,

TABLE IX

AGE-GRADE DISTRIBUTION ACCORDING TO STAGE OF MATURITY—BOYS

C. A.	GRADE	4TH	5TH	6TH	7TH	8TH	9TH	10TH	11TH	12TH	TOTAL
9—	Stage 1	45	6								51
	Stage 1+	15									15
	Stage 2	3(18)									3(18)
	Stage 3										
	Total	63	6								69
10—	Stage 1	59	43	2	3						107
	Stage 1+	41	29		2						72
	Stage 2	4(45)	3(32)		(2)						7(79)
	Stage 3	1	1		1						3
	Total	105	76	2	6						189
11—	Stage 1	20	32	7	7						66
	Stage 1+	29	46	15	12	1					103
	Stage 2	1(30)	7(53)	6(21)	3(15)	(1)					17(120)
	Stage 3		1	1							2
	Total	50	86	29	22	1					188
12—	Stage 1	3	8	2	6	1	1				21
	Stage 1+	16	28	18	69	13					144
	Stage 2	8(24)	16(44)	8(26)	29(98)	4(17)	2(2)				67(211)
	Stage 3	1		2	3						6
	Total	28	52	30	107	18	3				238
13—	Stage 1		3	4	9	3	2				21
	Stage 1+	9	11	6	57	22	2				107
	Stage 2	8(17)	18(29)	11(17)	51(108)	52(74)	7(9)				147(254)
	Stage 3				11	9	3		3		26
	Total	17	32	21	128	86	14		3		301
14—	Stage 1			3	4	3	3				13
	Stage 1+		3	3	20	17	13	1			57
	Stage 2		8(11)	6(9)	53(73)	49(66)	41(54)	5(6)			162(219)
	Stage 3		3	1	18	39	39	10	8		118
	Total		14	13	95	108	96	16	8		350

15—	Stage 1				1		2	2			5
	Stage 1+	1			4	8	4	2			19
	Stage 2	1(2)	2(2)	4(4)	6(10)	18(26)	19(23)	10(12)	4(4)		64(83)
	Stage 3		4	1	11	17	43	52	31	1	160
	Total	2	6	5	22	43	68	66	35	1	248
16—	Stage 1										
	Stage 1+						1				1
	Stage 2				1(1)	3(3)	1(2)	4(4)	5(5)	1(1)	15(16)
	Stage 3				3	15	22	55	45	8	148
	Total				4	18	24	59	50	9	164
17—	Stage 1										
	Stage 1+								1		1
	Stage 2					1(1)			2(3)		3(4)
	Street 3						3	12	28	25	68
	Total					1	3	12	31	25	72
18—	Stage 1										
	Stage 1+								1		1
	Stage 2										
	Stage 3						1	13	17	10	41
	Total						1	13	18	10	42
19—	Stage 1										
	Stage 1+										
	Stage 2										
	Stage 3							1	6	8	15
	Total							1	6	8	15
T—	Stage 1	127	92	18	30	7	8	2			284
	Stage 1+	111	117	42	164	61	20	3	2		520
	Stage 2	25	54	35	143	127	70	19	11	1	485(1005)
	Stage 3	2	9	5	47	80	111	143	138	52	587
	Total	265	272	100	384	275	209	167	151	53	1876

TABLE IX (Continued)—Girls

C. A.	Grade	4th	5th	6th	7th	8th	9th	10th	11th	12th	Total
9—	Stage 1	97	12								109
	Stage 2	8									8
	Stage 3										
	Total	105	12								117
10—											
	Stage 1	92	106	7							205
	Stage 2	24	36	5							65
	Stage 3	1	1								2
	Total	117	143	12							272
11—											
	Stage 1	31	70	23	9						133
	Stage 2	35	73	31	13	1					153
	Stage 3	3	7	3	3						16
	Total	69	150	57	25	1					302
12—											
	Stage 1	9	18	11	15	2					55
	Stage 2	20	51	23	72	8					174
	Stage 3		11	9	31	8	1				60
	Total	29	80	43	118	18	1				289
13—											
	Stage 1	1	5	4	7	3					20
	Stage 2	3	27	19	74	46	7				176
	Stage 3	1	19	15	68	64	13	3			183
	Total	5	51	38	149	113	20	3			379
14—											
	Stage 1		1	1	1						3
	Stage 2	1	6	3	15	31	19	2			77
	Stage 3	2	4	10	43	81	75	28			243
	Total	3	11	14	59	112	94	30			323

15—	Stage 1										
	Stage 2		3	2	2	8	1	1	1	2	18
	Stage 3		4	4	11	27	59	89	14	2	210
	Total		7	6	13	35	60	90	15	2	228
16—	Stage 1										
	Stage 2										
	Stage 3				1	6	22	45	1		1
	Total				1	6	22	45	86	20	180
									87	20	181
17—	Stage 1										
	Stage 2										
	Stage 3						1				1
	Total				1		22	14	56	50	143
					1		23	14	56	50	144
18—	Stage 1										
	Stage 2										
	Stage 3										
	Total					1	4	5	15	19	44
						1	4	5	15	19	44
19—	Stage 1										
	Stage 2										
	Stage 3										
	Total						2		3	10	15
							2		3	10	15
T—	Stage 1	230	212	46	32	5					
	Stage 2	91	196	83	176	94	28	3	2		525
	Stage 3	7	46	41	158	187	198	184	174	101	673
	Total	328	454	170	366	286	226	187	176	101	1096
											2294

TABLE X

SUMMARIES OF AGE-GRADE DISTRIBUTIONS ACCORDING TO TYPE OF MATURING

	Boys Age For Maturing								Girls Age For Maturing							
	Early		Normal		Late		Total		Early		Normal		Late		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Under Age For Grade																
Stage 1			22				22				28	93	2	03	30	
Stage 1+			31				31									
Stage 2			25		1		26				36	97	1	03	37	
Stage 3	7		58				65		12	13	80	87			92	
Total	7	05	136	94	1	01	144	100	12	08	144	91	3	01	159	100
Normal Age For Grade																
Stage 1			206		10		216				388	91	36	09	424	
Stage 1+	15		333		2		350									
Stage 2	3		279		11		293		8	02	429	97	3	01	440	
Stage 3	29		336				365		52	07	693	93			745	
Total	47	04	1154	94	23	02	1224	100	60	04	1510	94	39	02	1609	100
Overage For Grade																
Stage 1			38		8		46				31	44	40	56	71	
Stage 1+			138		1		139									
Grade 2			160		6		166				180	92	16	08	196	
Stage 3	1		156				157		14	05	245	95			259	
Total	1	00	492	97	15	03	508	100	14	03	456	86	56	11	526	100
Total																
Stage 1			266		18		284				447		78		525	
Stage 1+	15		502		3		520									
Stage 2	3		464		18		485		8		645		20		673	
Stage 3	37		550				587		78		1018				1096	
Total	55		1782		39		1876		86		2110		98		2294	

TABLE XI

SUMMARIES OF AGE-GRADE DISTRIBUTIONS ACCORDING TO TYPES OF MATURING, HIGH IQ

	Boys Age por Maturing							Girls Age for Maturing						
	EARLY		NORMAL		LATE		TOTAL	EARLY		NORMAL		LATE		TOTAL
	NO.	%	NO.	%	NO.	%	NO. %	NO.	%	NO.	%	NO.	%	NO. %
Underage for Grade														
Stage 1			8				8			20		1		21
Stage 1+			12				12							
Stage 2			10				10			21				21
Stage 3	3						3	9		8				17
Total	3	25	30	16			33	9	35	49	19	1	10	59
Normal Age for Grade														
Stage 1			30				30			95		8		103
Stage 1+	5		60				65							
Stage 2	1		52				53	3		71				74
Stage 3	3		14				17	12		42				54
Total	9	75	156	81			165	15	65	208	80	8	80	231
Overage for Grade														
Stage 1			1				1			1		1		2
Stage 1+			3				3							
Stage 2			2				2			3				3
Stage 3			2				2			4				4
Total			8	03			8			8	01	1	10	9
Total														
Stage 1			39				39			116		10		126
Stage 1+	5		75				80							
Stage 2	1		64				65	3		95				98
Stage 3	6		16				22	21		54				75
Total	12	100	194	100			206	24	100	265	100	10	100	299

of course, unavoidable with the use of *one* chronological age and it may be that the results are due to the stage of maturity and not to the *type* of maturing. To ascertain this, it is necessary to find out whether any one stage has more underageness than any other among the children of normal age for maturing. If it has, then the type of maturing predominant in that stage should be predominant also in the underage group. If it is not predominant in the underage group, then there is a relationship between underage and type of maturing that is due to the type of maturing and not to stage. To get the relationship to underageness for the three stages, it is necessary to select chronological age groups containing more than one stage of normally maturing children. In the case of the girls these would be 10- and 13-year-olds. These ages would give a basis of comparison for stages one and two in

TABLE XII

SUMMARIES OF AGE-GRADE DISTRIBUTIONS OF GIRLS OF HIGH IQ, 12 YEARS OLD, ACCORDING TO TYPES OF MATURING

	AGE FOR MATURING							
	EARLY		NORMAL		LATE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%
Under Age for Grade								
Stage 1					1			
Stage 2			7					
Stage 3	8							
Total	8	47	7	21	1	10	16	
Normal Age for Grade								
Stage 1					8			
Stage 2			25					
Stage 3	9							
Total	9	53	25	73	8	80	42	
Over Age for Grade								
Stage 1					1			
Stage 2			2					
Stage 3	0							
Total	0	00	2	06	1	10	3	
Total Stage 1								
Stage 2								
Stage 3								
Total	17	100	34	100	10	100	61	

TABLE XIII

SUMMARIES OF AGE-GRADE DISTRIBUTIONS OF GIRLS OF HIGH IQ, 10 AND 13 YEARS-OLD, NORMAL AGE FOR MATURING

	10 YEARS OLD						13 YEARS OLD					
	STAGE 1		STAGE 2		STAGE 3		STAGE 1		STAGE 2		STAGE 3	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Under Age for Grade	4	08	2	11					6	38	8	36
Normal Age for Grade	44	92	16	89					10	62	13	59
Overage for Grade	0	00	0	00					0	00	1	05
Total	48	100	18	100					16	100	22	100

the 10-year-olds, and for two and three in the 13-year-olds (see Figure 3 showing normal ages for maturing for each stage and sex). Table XIII gives us this comparison. Stage 1 has 8 per cent underage and none overage and stage 2, 11 per cent underage and none overage at 10 years old; at 13 years old, stage 2 has 38 per cent underage and none overage, while stage 3 has 36 per cent underage—almost the same—and 5 per cent overage. What is of importance in this is the *tendency* that this indicates, i.e., that the immature girls are at a slight disadvantage (using underage as an advantage) and that the maturing child is slightly ahead of the mature at 13 years. For normally maturing, high IQ girls, then, the maturing child is ahead of the mature and the immature with respect to underageness.

It has been impossible to select for the boys of high IQ ages containing a sufficient variety of stages to permit of the same comparison.

Although the percentages for underageness have been different when data for all children and when data for those of high IQ only were considered, the general story has been the same. For this reason it is possible to throw the three groups of IQ's together and examine all the 10- and 13-year-old girls and the 12- and 14-year-old boys, normal age for maturing, to see what stage pre-

TABLE XIV

SUMMARIES OF AGE-GRADE DISTRIBUTIONS ACCORDING TO STAGE AND AGE, 12 AND 14 FOR BOYS AND 10 AND 13 FOR GIRLS, NORMAL AGE FOR MATURING

	BOYS								GIRLS					
	12 YEARS OLD				14 YEARS OLD				10 YEARS OLD			13 YEARS OLD		
	ST. 1	ST. 1+	ST. 2	ST. 3	ST. 1	ST. 1+	ST. 2	ST. 3	ST. 1	ST. 2	ST. 3	ST. 1	ST. 2	ST. 3
Underage For Grade														
No.	2	13	6			1	5	18	7	5			7	16
Per Cent	09	09	09			01	03	15	03	07			28	19
Normal Age For Grade														
No.	8	87	37			30	90	78	198	60			120	132
Per Cent	39	60	55			53	56	66	97	92			68	72
Overage For Grade														
No.	11	44	24			26	67	22					49	35
Per Cent	52	31	36			46	41	19					04	09
Total														
No.	21	144	67			57	162	118	205	65			176	183
Per Cent	100	100	100			100	100	100	100	100			100	100

dominates in the age-for-grade groups. The bases for the percentages are again the totals in each stage. Table XIV shows this.

Again, more clearly than before, a larger percentage is found among the underage girls in stage 2 (7 per cent) than is found in either stage 1 (3 per cent) or stage 3 (none); and for the boys a larger percentage of underage boys is found in stage 3 (15 per cent) than is found among the underage boys in either stage 1 (1 per cent) or stage 2 (3 per cent).

The question to be answered is that of the relationship between the early maturing and the underage groups. It has been shown that early maturing children and underage children are to some extent the same. But the early maturing are stage 3, the normally maturing are stage 2, and the late maturing are stage 1. Hence, it may be that the mature child, stage 3, advances rapidly and so is underage because of maturity rather than because of early maturing. Hence, it is necessary to determine whether any particular stage tends to be underage. If some one stage *does* tend to be underage, does tend to have a larger percentage in the underage group, then since the early and the underage fall together, the stage showing a relationship with underage will naturally show some relationship with early and consequently nothing can be concluded about the real relationship between early maturing and underage.

In order to get this relationship between stage and underage, children, normal age for maturing of the same chronological age but of different stages, were examined. Stage 2 for girls and stage 3 for boys were found to be the stages which show the largest percentage of underageness. The problem has now resolved itself again into whether the relationship between early and underage and late and overage is due to stage or to type of maturing. In the case of the girls the line of reasoning is this: The early maturing girls make up the larger portion of the underage group (Tables XI and XII) and these early maturing girls are larg ly stage 3 (p. 48); but stage 2 normally shows the larger percent of underageness (p. 69). Hence the stage 3 girls who show the larger percent of underageness are really early maturing, and of girls it can be said with reason that those who mature early tend to appear in the underage group.

In the case of the boys, the early maturing children appear in greater numbers in the underage group than in the overage group (Table XI). Again, the early maturing are stage 3, but stage 3 shows also the largest percentage of underageness for the normal maturing. Hence it cannot be said for the boys as definitely as for the girls that early maturing of itself has a tendency to enable those children maturing early to push on ahead of their grade for their age in school. The figures for the boys again state less than do the figures for the girls. Enough has been shown, however, to establish with a reasonable certainty the fact that early maturing makes for underageness. It is quite possible, of course, that these children started school earlier—looked "big" for their age; there is no way of telling.

Another way to look at the matter is to examine year by year the distributions according to physiological stage and age-for-grade. Figure 6 gives these data. This distribution shows the relation of earlier maturing children to later at each chronological age, and so gives a relation between early and late maturing as to under and overage that is independent of the original way of determining early maturing used in this study— that of association with IQ. With few exceptions the more mature children are in a larger proportion in the underage group of each chronological age, and in a smaller proportion in the overage group. The results for the boys are not as decisive as those for the girls. This agrees with what was found concerning IQ and early maturing, that underage and high IQ fall together.

To sum up, the age-grade table sub-divided according to physiological stages has yielded this much:

1. Underageness and early maturity run together for girls and less decisively for boys in the totals and for children of high IQ.
2. For normally maturing children, the second stage girls and the third stage boys show more underageness than do the children of the other stages.
3. Generally speaking, at any chronological age where the numbers permit of any comparison, the more mature children show the greater per cent of underageness and the smaller per cent of overageness.

3. *Types of Maturing and School Marks*

The question has been raised, notably by Ogden, in his "Psychology and Education" (24), as to whether a child's

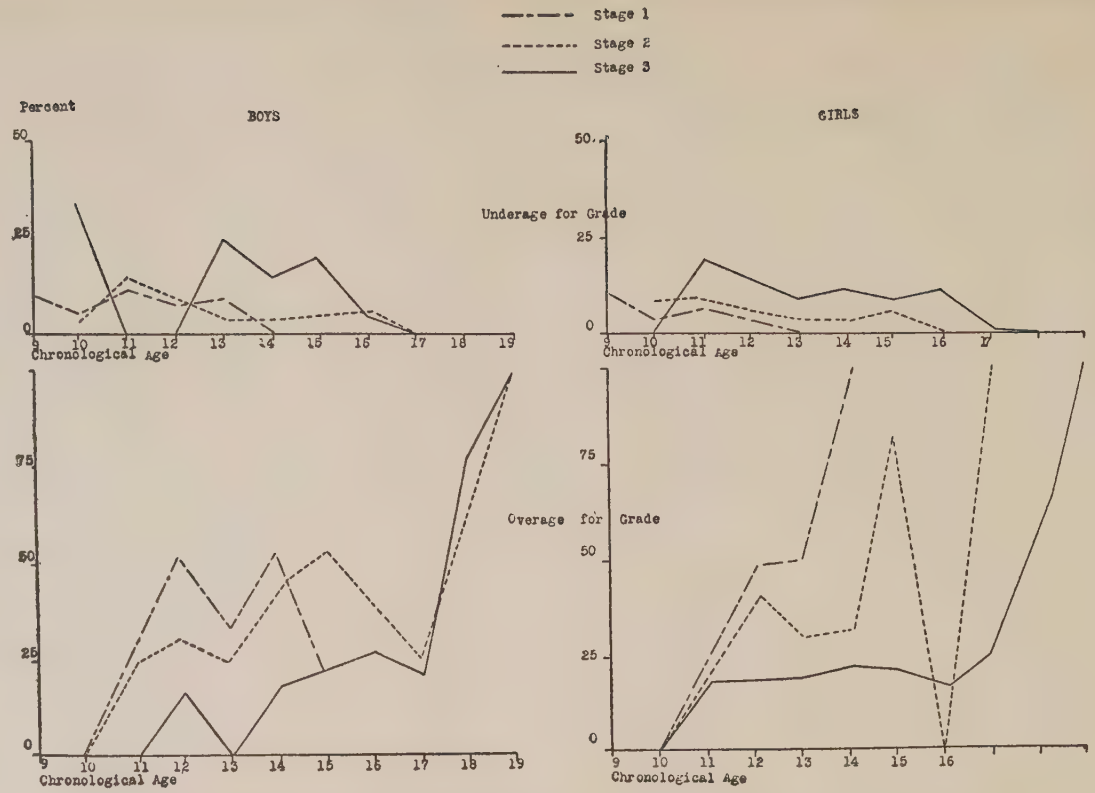


FIGURE 6—UNDERAGE AND OVERAGE CHILDREN, ACCORDING TO STAGE OF MATURITY AND CHRONOLOGICAL AGE

mentality (mental age) might not keep pace with his physiological age rather than his chronological age. If it did much would be accounted for, not the least being the infant prodigies who turn out to be merely normal children as they grow older. If this is true, then the late maturing high IQ children would really have a better mentality than the early maturing high IQ's of the same IQ and of the same chronological age, because the mental age—the same in each—should be divided by an earlier physiological age in the case of the late maturing than in the case of the early maturing. For example:

Child 1		Child 2	
Mental age	15	Mental age	15
Chronological age	10	Chronological age	10
Physiological age (early maturing)	15	Physiological age (late maturing)	8
IQ (Chronological age)	150	IQ (Chronological age)	150
IQ (Physiological age)	100	IQ (Physiological age)	190

In other words, the IQ for a late maturing boy or girl is really indicative of a greater degree of "brightness" than is the same IQ for an early maturing child. Following this line of reasoning suggests other interesting relations. The early maturing high IQ's and the late maturing low IQ's should be much nearer in brightness than normally maturing high and low IQ's; and the early maturing low IQ should be the dullest of the four groups. The possible order of brightness, then, would be:

1. Late maturing high IQ.
2. } Early maturing high and late maturing low IQ.
3. }
4. Early maturing low IQ.

The data for this group of New Britain children include their teachers' marks for their term's work. Teachers' marks are, of course, in bad repute at present, not correlating closely with IQ (perhaps they would do better with an IQ based on physiological age), but marks are, after all, a kind of measure of the brightness of the children. The median marks for these four divisions are given in Table XV.

TABLE XV

MEDIANS OF TEACHERS' MARKS FOR TYPES OF MATURING
(100— perfect)

	BOYS			GIRLS		
	Q_1	MED.	Q_3	Q_1	MED.	Q_3
Late high.....		82.5		89.5	87	83
Early high.....	88.5	83	78.5	91	86	78
Late low.....	86	79.5	72	79	76	69.5
Early low.....	86	79	72	88	85.5	77

Although speculation has fallen afield it is interesting to note that the late maturing high IQ girls make better marks than the early, and that late maturing is, at any rate, no disadvantage to the boys when it comes to the kind of brightness that enables them to get good marks.

CONCLUSIONS

There is a little evidence that mental age keeps pace with physiological age rather than chronological age, since the median mark for late maturing high IQ girls exceeds that of the early maturing high IQ, although only slightly, and hence some approximation of physiological age is probably necessary in order to obtain a satisfactory IQ.

4. *Summary of Chapter III—How They Progress Through School Stage by Stage*

In connection with progress through school stage by stage, three things stand out:

1. No grade or grades except the 12th has a monopoly of any stage or stages. Almost one need be surprised at nothing in the relationships of stage and grade.

2. Early maturing on the whole is an advantage, if getting ahead of grade is an advantage.

3. It is well to be cautious about IQ's, for mental age may be advancing with physiological age rather than chronological age.

IV

Personality Traits and Stages of Physiological Maturity

In this part of the investigation, the attempt was made to secure some data on the much discussed subject of adolescent traits. From literature on the adolescent, seventeen traits were selected.

1. Impatience with restrictions
2. Self-assertion
3. Sympathy for the weak
4. Interest in opposite sex
5. Avoidance of opposite sex
6. Coöperation
7. Interest in a particular occupation
8. Exploration
9. Evidence of religious awakening
10. Gregariousness
11. Interest in causes such as S.P.C.A.
12. Desire to reform others
13. Loyalty to a cause
14. Loyalty to a principle
15. Loyalty to a school
16. Loyalty to a clique
17. Loyalty to a person

Method of Securing the Data on the Traits

On pages 2 and 3 of the leaflets, the teachers checked in their groups those children showing conspicuously any of the traits listed above. If for the present it is assumed that the teachers checked correctly, i.e., that each child checked really showed the trait for which he was checked, each child falls naturally into one of three divisions:

1. Children showing traits to such an extent that they are noticed by their teachers. These children are checked as showing the traits conspicuously.

Possibly 2. Children having traits, but not showing them under the circumstances.

Possibly 3. Children not possessing the traits.

Nothing is known about groups 2 and 3. Something, however, is known about group 1. It would be desirable to include 2 and 3 in the study, but nothing is known about them. One of the things known about children in group 1 is that they exhibit in school life to someone certain traits more conspicuously than do certain other of their schoolmates. Figure 7 may help to make this

clearer. In child A, trait 1 is more conspicuous in her make-up than it is in child B's, since in B's traits 2, 4, and 6 appear, but not trait 1. Nothing is known about child C in connection with the traits.

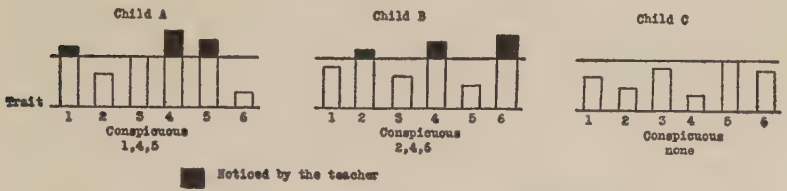


FIGURE 7. TRAITS RECORDED AS CONSPICUOUS BY THE TEACHER

Since nothing is known about groups 2 and 3 with respect to traits, no attempt is made to study them. They are dropped out of this part of the study. That leaves group 1—all children showing any trait or traits to such an extent that a trait is noticed by the teacher who has had charge of him every day five days in the week for at least 10 weeks (the leaflets, see fig. 1 p. 26, were given to the teachers the first week in November and collected the first week in January). This group—all children who have shown any trait—is the group used in Chapter IV of this study. In this group some children show trait X and some do not. They may have it and not show it or they may not have it. Group 1 with respect to any trait divides as did the original group.

But there is this difference between the divisions of group 1 with respect to trait X and the divisions of the original group with respect to showing any trait: every child in group 1 has shown some trait conspicuously, so that if he does not show trait X, trait X is less conspicuous than some other trait in his make-up at this time under these circumstances. That gives a basis of comparison.

When it is said, then, that more children of a certain type (IQ, Chronological Age, Physiological Stage) show trait X than do children of another type, it is implied that there are in the school children who are so adjusted to school that they exhibit something in the way of traits. The type of child who doesn't possess a trait,

or who possesses it and doesn't show it, as compared with the child who shows it, is beyond the scope of this study.

From group 1, then,—those showing any trait at all—the children showing trait X are selected. It is fairly certain that these children have trait X since trait X has stood out sufficiently for the teachers to note it. Other characteristics these children have, what tendencies they show, are then noted. Children who have been noted in this way by their teachers as showing trait X are in general taken as samples of children who have trait X conspicuously. It may perhaps be questioned whether children thus selected as showing trait X conspicuously are really representative of all children having the trait. If they are not, then the scope of the conclusions will also be limited to those children showing the trait conspicuously rather than to all who have the trait. So much for the children included in this part of the study.

It has been assumed that the teachers have made no mistakes in checking trait X when the child shows it; and that is a dangerous assumption. There are, of course, in any recording of traits, differences in teachers' judgments, differences of opinion as to whether or not a child has a trait. There is, perhaps, a chance that results are due to the kind of teacher and not the kind of child. What *might* happen if other teachers recorded traits for a child is this:

1. Another teacher in judging John might fail to recognize the presence of trait X and so not record it.

2. Another teacher in judging John might call his behavior trait Y instead of trait X.

These two possibilities should be considered separately. What effect on the results would a failure to record a trait have? It makes no difference why the teacher fails to record it—inexperience, peevishness, paralyzed judgment, over-conscientiousness, indifference. The fact remains: teacher 1 recorded trait X; teacher 2 did not. The children dealt with in this part of the study are said to show conspicuously a certain trait or traits. If the trait is recorded for John, then the kind of child John is (IQ, Chronological Age, etc.) helps to swell the information about children who show the trait. If the trait is not recorded for John, the information John could furnish is not used. The more

children like John who show the trait, the more information is available about it, the more the numbers pile up—that is all. Except in one case, that of determining which traits are shown by the most and which by the fewest children, the findings on one trait are not compared with those on another. When the findings on the one trait, trait X, are analyzed, all there is to work with are the children who had trait X recorded for them. Fewer records mean fewer cases on which to draw conclusions—not a skewing of results in any way. Failure to record the trait, then, can hardly affect the results to any great degree.

Next, what would be the effect on the results of a substitution of trait Y for trait X in describing a certain type of behavior? If other teachers had recorded the data, they might have done one of three things and so been responsible for results other than the ones recorded here.

1. They might not have recognized trait X as trait X and called it now trait Y, now Z, now something else. But this condition would result in no definite trends in percentages, would be indeterminate, the normal result of unreliable data or irrelevant data. The results in the study show distinct trends, trends checked by coefficients of association and so beyond the probable error of sampling. Hence it hardly seems possible that the teachers recorded traits in a haphazard fashion, now one thing, now another for the same type of behavior.

2. They might have called trait X trait Y. That, of course, if consistently carried out, would have made a trend different from that shown here. But the trends in this study are the results of observations by many teachers; these trends show that the traits which were named what they were by the teachers, most peculiarly seem to be tacked on to a certain type of child. This could hardly happen unless there were (1) fair agreement among teachers in calling trait X trait X, or (2) some constant error in judgment peculiar to several teachers, and a constant error would have to be one in recording and not in omitting to record—omissions have practically no effect on these data other than reducing the amount of available material.

There might have been, to be sure, a constant error in calling trait X trait Y, but it would have had to be something on this

order: elementary school teachers or Catholic teachers or dissatisfied teachers would have had to *agree* for some reason or other in calling trait X trait Y, for trends are quite decided. Elementary school teachers might have called trait X gregariousness, while junior high school teachers called it coöperation; but the elementary teacher would hardly have called it gregariousness among first stage children and something else among second stage children. Trends run across the schools, appearing most decidedly in connection with IQ's, stages of maturity, etc., items common to all the groups of children. Group agreement in calling trait X trait Y seems, in view of the trends, unlikely.

3. The teacher might have labeled children indiscriminately whenever they attracted her attention as exhibiting trait X, and so created a group of X's out of Y's and Z's and everything else. But there are seventeen traits, and the trends vary, not as widely as they might, to be sure (note the number of stage 3 high IQ traits), but widely enough, it seems, to make improbable a blind checking of some one trait or group of traits regardless of any difference in the behavior of the children. It is true that in a few cases almost an entire room was checked for loyalty to the school or for coöperation, but it *is* "almost", and rooms were not so checked for the traits less likely to contribute to ease in discipline. No room full of self-assertive children, for instance, appeared in any leaflet. A group exhibiting X, created out of whole cloth, seems improbable.

It might be said, also, in connection with errors in recording, that the leaflets were planned with just that point in mind. In any investigation of this sort, undertaken throughout a large school system, where the individuals concerned with making the records have only an academic concern in the proceedings, one cannot expect a detailed interest in what would naturally appear as an extra bit of work to be sandwiched into a program already full, as all public school programs are. One *should* not, even if one would. Teachers were asked to record what "jumped up and hit them" about a child, and not what they had learned from a careful individual study of him. They were asked merely to indicate conspicuous presence or conspicuous absence in the column belonging to the trait whenever they noticed it. They were not

asked to do it until they had had the children for at least two months. The leaflets were in their hands for another two months so that they had plenty of time both for recording and for getting used to the idea of recording. Furthermore, the teachers were assured that for many children there would be no records at all—that that was to be expected from the nature of the data. The trait that a child showed in such a way as to attract her attention was the trait that a teacher was asked to record. The retiring child probably got left, nine times out of ten, in this process, and so is not used in this part of the study. The ease of recording and the insistence on conspicuousness as well as the assurance that many blanks were to be expected under normal conditions would, it would seem, tend to make what was recorded reasonably correct. Besides this ease of recording and the insistence on conspicuousness, the make-up of the leaflets presumably favored accuracy. In the directions to the teachers an illustration of how the traits should be noted was given. See page 29. All traits were not so illustrated for the simple reason that too much illustration would tend to make the matter look like a job that would require too much time. Also, one illustration would serve under normal conditions. All together these conditions tended:

1. To prevent teachers from feeling that there was too much work to do in connection with the study.

2. To make the teacher who, in the hurry of more pressing events, sticks the paper in her drawer till the last minute and then answers the questions hurriedly—the average teacher—give really a more accurate account of conspicuous traits than the extremely conscientious teacher who studies her pupils with the traits in mind and so finds all traits in each child.

3. To make the conscientious teacher lose, perhaps, some of the finer details of her observations and so stick more to essentials.

There is, also, perhaps, to be considered traits dealt out wholesale to the good little girl and the bad little boy or to the bad little girl and the good little boy—teacher's pets and teacher's abominations, the halo and the horns, the possibility of this making a constant error. A consideration of the four traits most frequently recorded, shows only a little chance of the halo's operating. Of these traits, loyalty to a school and coöperation might be

recorded as a sign of a teacher's favor, but hardly self-assertion and gregariousness. In the face of the trends, a constant error from that source does not seem feasible. Consider Table XVI. This should read: Trait six appears with trait fifteen 38 per cent of the time; with ten, 36 per cent of the time, etc. Hence, not much "halo" here. But fifteen appears with six 60 per cent of the time. Hence fifteen has an association with six, but not six with fifteen.

The Q's for these traits alone and in combination show a decided association between fifteen and six. If there is any "halo" shown here, however, it is very one-sided, for while loyalty to a school is largely accompanied by coöperation—60 per cent of the time—coöperation manifests itself in many different combinations, each appearing with much less frequency, *i.e.*, only 28, 24, 36 and 38 per cents of the time (see "Coöperation" in Table XVI).

Since, then, variation in teachers' judgments is probably not an important source of error, and since the make-up of the leaflets limited error, the chances of the traits' being recorded with some degree of accuracy seem good.

TABLE XVI

Traits in Combination

	Self-assertion (2)	Coöperation (6)	Gregariousness (10)	Loyalty to school (15)
Alone.....	No. 103 24%	No. 118 28%	No. 177 37%	No. 57 22%
With 2.....		No. 103 24%	No. 163 34%	No. 48 18%
With 6.....	No. 103 24%		No. 151 32%	No. 159 60%
With 10.....	No. 163 38%	No. 151 36%		No. 89 34%
With 15.....	No. 48 11%	No. 159 38%	No. 89 19%	
Totals.....	424	424	474	265

Methods of Analyzing Traits

First, the percentage of children showing each trait was found and these percentages were ranked.

Second, those children showing each separate trait were counted and distributed in age-grade tables, one table for each trait for each group of high, normal, and low IQ's. The number of children in each stage of maturing was recorded separately. (See Table XVII.) There are, for instance, showing gregariousness five eleven-year-old girls of normal IQ who are in the sixth grade and are immature or in the first stage.

Next, the number of children showing any trait at all was found and this number distributed in an age-grade table. There are, for instance 12 eleven-year-olds among the sixth grade stage 1 girls showing at least one trait conspicuously. (See Table XVIII.)

These (the numbers of children showing the trait) were taken as the bases for all percentages and coefficients of association when such were needed. Another possible basis might have been the total number of children in this study. There are, for instance, thirteen girls, normal IQ, stage 1, in the eleven-year sixth-grade position on an age-grade table utilizing all normal IQ stage 1 girls in the study. There are only twelve on the Table XVIII, those showing some trait or traits. That means that there was one child who exhibited no trait of any kind conspicuously. Nothing stood out in her, though any trait or traits might have been present for all we know; the other twelve showed plainly some trait or traits. Now in Table XVII in the eleventh-year sixth-grade group, there are five of the first stage who show gregariousness. They showed gregariousness *over and above* some other traits (if they had others) and hence gregariousness won out, so to speak. Gregariousness, then, was more conspicuous in these five than it was in the seven who showed other traits, but did not show gregariousness. (See Figure 7, page 75.) It seems fairer, in judging the type of child who exhibits gregariousness, to use as a base all children showing any trait at all than to use all children in the study. On this basis, then, the girls of normal IQ, stage 1, eleven years old, sixth grade, who show gregariousness conspicuously are $^{5}/_{12}$ or 41 per cent of the girls in grades 4–9 who show traits at all.

Third, these percentages were found for various groups as

TABLE XVII

AGE-GRADE TABLE—GIRLS NORMAL IQ SHOWING GREGARIOUSNESS

GRADE	STAGE	9	10	11	13	14	13	15	16+	TOTAL
4	1 2 3	14	12 8	4 3						31 11(42)
5	1 2 3		5 1	11 10 1	4	2				16 14(34) 4
6	1 2 3			5 4	3 1	1 1				5 8(15) 2
7	1 2 3				4 15 5	1 16 9	2 7		1	5 33(60) 22
8	1 2 3				1 1	2 9 21	5 7	1 4		3 15(51) 33
9	1 2 3					6	7 40	17	4	7 (74) 67
Total	1 2 3	14 (14)	17 8(26) 1	20 17(38) 1	6 22(35) 7	3 26(68) 9	14(68) 54	1(22) 21	(5) 5	60 88(276) 128

TABLE XVIII

AGE-GRADE TABLE—GIRLS NORMAL IQ SHOWING ANY TRAIT

GRADE	STAGE	9	10	11	12	13	14	15	16+	TOTAL
4	1 2 3	34 3(37)	35 12(47)	10 8(18)	1 2(3)					80 25(105)
5	1 2 3	1 (1)	27 10(38) 1	27 28(57) 2	2 9(12) 1	2(6) 4	(1) 1			57 49(115) 9
6	1 2 3		2 (2)	12 15(27)	3 8(13) 2	1 5(11) 5	(1) 1			18 28(54) 8
7	1 2 3			2 (2)	7 29(46) 10	5 39(73) 29	6(17) 11	1(1)	(1) 1	14 75(140) 51
8	1 2 3				1 1(3) 1	3 30(73) 40	18(59) 41	3(14) 11		4 52(149) 93
9	1 2 3					(8) 8	11(62) 51	1(31) 30	(7) 7	12(108) 96
Total	1 2 3	35 3(38)	64 22(87) 1	51 51(104) 2	14 49(77) 14	9 76(171) 86	35(140) 105	5(46) 41	(8) 8	173 241(671) 257

needed. Any percentages used in this study have been found on this basis. This is important to remember. Frequently when percentages and coefficients of association were found for several adjacent groups, they showed certain trends. For instance, take boys showing coöperation who are normal age for maturing, all IQ's. The question is: do boys with high IQ show coöperation more readily than do boys of low, or does IQ have nothing to do with exhibiting this trait. The figures would run like this:

	Normal Age For Maturing			
Boys	High IQ	Normal IQ	Low IQ	Total
Showing any trait.....	180	487	220	887
Showing cooperation	99	228	73	400
Coefficient of association, Q....	+.245	+.077	−.320	

A decided trend toward high IQ appears here; i.e., those children of high IQ are more likely to show coöperation than are those of low IQ—See Figure 8.

In Figure 8, all portion of Q within five times its probable error is placed within the shaded area. For $Q = .077 \pm .0227$, all of it lies within the shaded part. For $Q = -.320 \pm .0202$, .101 of it lies there. Whatever remains beyond this disputed portion, is pictured as appearing beyond the shaded area, a significant Q plus or minus as the case may be. The Q for normal IQ, since it does not reach beyond five times its probable error, does not appear at all beyond the shaded area.

The actual numerical value of Q is of no value here. If the coefficient is at least five times the probable error and so beyond the errors of sampling, the trend is established. *Tendencies* only in a group study such as this are important, and the confirming of a trend by Q makes it possible to consider that the existence of the particular tendency shown here is established. A plus or a minus sign in the tables in connection with a trend means that the value of Q for the particular group is significant. Hence the trend seems to be a genuine tendency for these children.

On the basis of this procedure, different conditions under which the traits appear are analyzed.

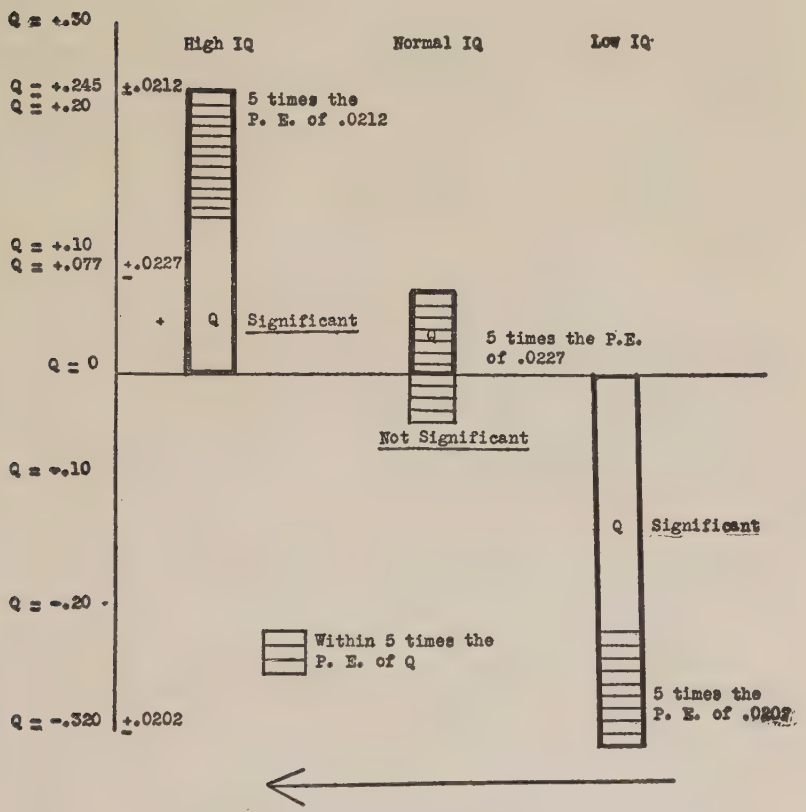


FIGURE 8. TREND TOWARD HIGH IQ SHOWN BY Q'S FOR TRAIT 6, COÖPERATION, BOYS, NORMAL AGE FOR MATURING

3. *Results*

The summary of the findings is given in Figure 10, p. 90. The coefficients of association on which Figure 10, Columns 9, 10, and 11, are based are found in Table XX, page 92. The five thousand odd per cents used in finding the trends for chronological age and grade in columns 2–8 inclusive are on file in the library of the University of Pennsylvania. Each column in Figure 10 is numbered at the foot of the page and references in the text to column 1, column 2, etc., are to these columns. The arrow opposite a trait points in the direction of a trend toward whatever is indi-

cated at the head of the column. + signifies a positive and − a negative association as determined by the finding of Q. Curves in place of arrows also indicate trends in percentages of children showing the trait beginning with nine years old and running up to 19 and over or beginning with the fourth grade and running through the ninth. No children above the ninth grade are included in this division of the study, the part dealing with traits of personality.

a. Percentage of Children Showing Each Trait

When the traits are ranked according to the percentage of children exhibiting them, although the traits do not take the same rank for the boys as for the girls, the first four and the last three places are occupied by the same traits for both boys and girls. The four traits shown by the largest percentage of boys and girls are:

	Boys	*Girls*
(2) Self-assertion	37%	39%
(6) Coöperation	46%	57%
(10) Gregariousness	46%	41%
(15) Loyalty to a school	31%	42%

The three traits shown by the smallest percentage of both are:

	Boys	*Girls*
(9) Evidence of religious awakening	7%	9%
(11) Interest in causes	9%	10%
(12) Desire to reform others	8%	8%

Trait 5, Avoidance of the opposite sex, takes almost the same rank and belongs among the lowest, shown by about 10 per cent only of the children who show any trait at all. A study of these four upper traits would be of particular interest. Column 1 of Figure 10 shows this situation.

b. Traits as Related to Chronological Age and Grade in School

To find the relationship of traits to these it is necessary to get, for instance, evidence that a larger and larger proportion of the

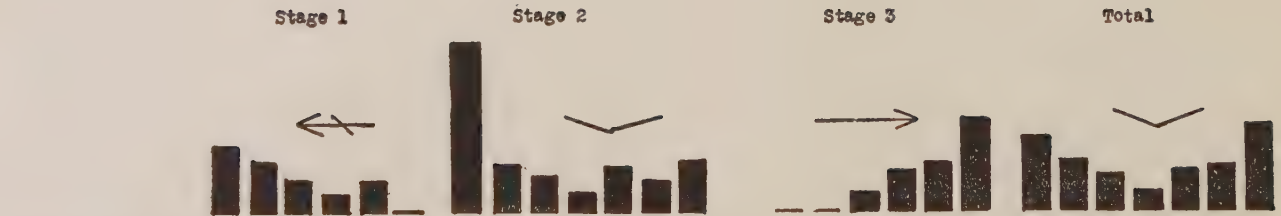
children show the trait as they grow older; which would mean, other things being equal, that the trait is a product of the years lived among other people rather than anything else—a social affair primarily. The distributions give the per cent of children of each chronological age for each group of IQ's for each stage. These groups must be examined separately in order to isolate the effect of age and grade. The trends made by the per cent of children showing the trait at each age and at each grade in each group are shown in columns 2–7 of Figure 10. The arrow points in the direction of the trend; a line through the arrow means the trend is broken; a broken line means a trend following the curve of the broken line. Figure 9, showing the trends in percents of girls showing interest in an occupation, illustrates this. These girls show a different trend for each stage. The trends indicated above the bars in Figure 9 are the same that are used in Figure 10 for trait 7.

It must be remembered that since the data have been subdivided so many times in order to increase the homogeneity of the groups, in most cases the numbers on which the percents are based are very small. The percents for this reason are unstable and should be considered only as *suggestive* of conditions, not as *descriptive* of them.

If, as is the case in high IQ girls for trait 13, loyalty to a cause, all arrows point to the left, signifying that in all stages high IQ girls exhibit the trait in fewer and fewer numbers proportionately as they grow older, it would be reasonable to conclude that for a group of high IQ children decreasing numbers of those children take an interest in causes as they grow older. Chronological age can be eliminated as a disturbing factor in connection with *increases* in association that ordinarily would be affected by it, i.e., third stage as against first stage children; as a group the third stage would be older than the first stage, of course.

In most cases there are no definite trends to help in determining the possible effect of age. Age and grade cannot be said to count or not to count in these cases, and qualifying statements about the trait in connection with age or grade can be made only in those cases in which there is definite evidence as noted in columns 2–7.

With the distributions according to chronological age definite



	Stage 1						Stage 2							Stage 3							Total						
Chronological Age	9	10	11	12	13	14	9	10	11	12	13	14	15	9	10	11	12	13	14	15	9	10	11	12	13	14	15
No. showing trait 7	9	13	6	1	1		2	4	7	3	13	4	1		0	0	1	14	20	18	11	17	13	5	28	24	19
No. showing any trait	35	64	51	14	9		3	22	51	49	76	35	5		1	2	14	86	105	49	38	87	104	77	171	140	54
Percent showing trait 7	26	20	12	07	11		67	18	14	06	17	11	20		0	0	07	16	19	37	29	20	13	06	16	17	35

FIGURE 9. PER CENT SHOWING INTEREST IN AN OCCUPATION AT EACH CHRONOLOGICAL AGE IN EACH STAGE, GIRLS, NORMAL IQ

trends appear (from 6–10 per cents increasing or decreasing as chronological age increases) in the following cases:

KEY

1. Impatience with restrictions
2. Self-assertion
3. Sympathy for the weak
4. Interest in opposite sex
5. Avoidance of opposite sex
6. Coöperation
7. Interest in a particular occupation
8. Exploration
9. Evidence of religious awakening
10. Gregariousness
11. Interest in causes such as S. P. C. A.
12. Desire to reform others
13. Loyalty to a cause
14. Loyalty to a principle
15. Loyalty to a school
16. Loyalty to a clique
17. Loyalty to a person

	TRAITS
Among children of high IQ:	
Girls: increasing with age	1
decreasing with age	13
Boys: increasing with age	4, 15
Among children of normal IQ:	
Girls: increasing with age	5
decreasing with age	14
Boys: increasing with age	16, 17
Among children of low IQ:	
Girls: decreasing with age	5, 14, 15
Boys: decreasing with age	9, 1

(1 for boys is considered also with respect to grade)

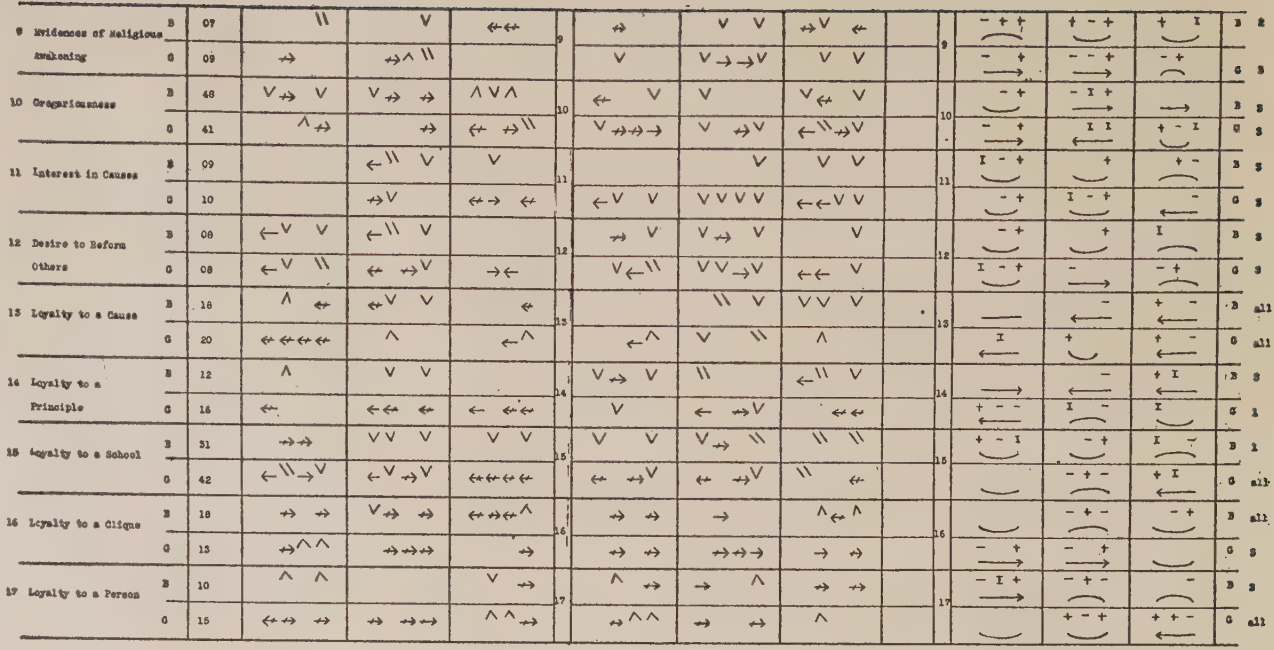
Only those in which the same trend is marked for all three stages or for two stages with the third stage blank are noted. A difference in trend in different stages does not make chronological age the factor of most importance in the distribution.

In drawing conclusions, then, about the traits noted above (1–4–5–13–14–15–16–17), chronological age should always be taken into consideration as a disturbing factor. The possible effect of chronological age and of grade will also be referred to for traits other than those noted above when a trend in age is noted for any stage characteristic of a trait, see page 99f.

TRENDS IN PER CENTS OF TRAITS FOR

TRENDS IN ASSOCIATIONS OF TRAITS WITH

TRAITS FOR BOYS AND GIRLS		Percent of children showing each trait	CHRONOLOGICAL AGE: High IQ in stage 1 2 3 T	CHRONOLOGICAL AGE: Normal IQ in stage 1 2 3 T	CHRONOLOGICAL AGE: Low IQ in stage 1 2 3 T	For	GRADE: High IQ in stage 1 2 3 T	GRADE: Normal IQ in stage 1 2 3 T	GRADE: Low IQ in stage 1 2 3 T	Differences between Distributions in the case of	STAGE: Normal IQ and Normal Age for Maturing	TYPE among the Normal IQ and all stages	IQ: Normal Age for Maturing, all IQ's	Stage used for trend in IQ
			Arrow shows trend in percents increasing or decreasing with advance in chronological age and in grade								TREND IS TOWARD: Stage	Type	IQ	
1 Impatience with Restrictions	B	29	↞ ↠ ↠	← ↠ ↞	^ ↞ ^	1		↞ ^	V ↞ ←		1	+	I	B 3
	G	15	↠ ↠ ^	↔ . ↠	→ ↠		↠ ↠	↠ ↠	^ ↔ ↠			- +	- I	G 3
2 Self-Assertion	B	37	↞	// ↞ ^	← \\ ↞ ←	2	^	↞	← ← ← ←		2		- I	B all
	G	39	↠ ↞	→ ↞ ^	← \\		→ ↠	→ ↠	↠ ↞	stage 1 low		I	I +	G all
3 Sympathy for the Weak	B	15	→ ↠	↞ V V	← \\	3	V V		V V		3	- I +	- +	B 3
	G	21	V ↞ ^	\\ ↞ ↠ V	← \\		↠ ↠	V ↠ V	↠ V	stage 3 low		- +		E 3
4 Interest in the Opposite Sex	B	15	↠ → V	\\ V	↞	4	↠ V	V V	→		4	- - +	I +	B 3
	G	18	→ . ^	↞ ↠ V	→ V		↠ ↞ V	V ↠ V	↠ ↞ ↠ ↠	stage 2 low		- - +	+ -	G 3
5 Avoidance of the Opposite Sex	B	11	V → V		V ↞	5	V V	↠	↞ ↠		5	- +		B 3
	G	10	→ V	V ↔ → V	← ← V		↞ ↠ V	↠ ↠ ↠	← ←			- +	- I +	G 3
6 Co-operation	B	46	^ ↞	V V ↞	\\	6	↞	V	↞ ↠		6		I - +	B all
	G	57	↞ ↞ ↠ \\	V V ↠ V	\\ ^ ↠			↠ ↠ → ↠	↠ \\			-	+	G 3
7 Interest in an Occupation	B	18	← \\	↠ V	→ →	7	↠	↠	↞ ↠		7	+	I +	B 3
	G	14	↠ ↠	↞ V → V	↞		↠	↞ V ↠	↞ \\ ^			-	I -	G all
8 Exploration	B	30	↠	V ↞	V ↠ ↞ \\	8		← ←			8	+ -	- + -	B 1
	G	17	V ^ \\	V V V	^		↞ V \\	V V V V	V ←				+ - +	G all



COLUMN 1 2 3 4 5 6 7 8 9 10 11

FIGURE 10—Trends in Relationships for Traits.
(ERRATUM: Column 8, traits 11 and 12, should show differences for stage 2, low IQ girls, as noted on page 96).

TABLE XIX

DISTRIBUTIONS AND COEFFICIENTS OF ASSOCIATION FOR TRAITS ACCORDING TO STAGE AND TYPE OF MATURING, BOYS

		A Normal IQ Normal Age For Maturing			B Normal IQ All Stages			C Normal Age For Maturing All IQ's			D
		Association of Trait with			Association of Trait with Type of Maturing			Association of Trait with			Association Found for Trait with
		St. 1	St. 2	St. 3	Early	Normal	Late	High IQ	Norm. IQ	Low IQ	
Total showing any Trait	No.	78	334	75	20	487	8	180	487	220	
1 Impatience with restrictions	No.	20	90	27	4	137	2	5	27	15	
	Q	−.075	−.091	.214	−.219	.178	−.072	−.038	−.068	.097	St. 3
2 Self-Assertion	No.	27	131	30	6	188	3	61	188	81	
	Q	−.101	.042	.035	−.189	.141	−.016	−.090	.066	−.011	All st.
3 Sympathy for the weak	No.	8	50	15	2	73	2	3	15	4	
	Q	−.246	−.002	.208	−.233	.028	.315	.143	.222	−.353	St. 3
4 Interest in the opposite sex	No.	8	47	20	3	75	2	6	20	7	
	Q	−.263	−.155	.405	−.021	−.088	.294	.404	.031	−.278	St. 3
5 Avoidance of the opposite sex	No.	11	33	15	2	59	1	2	15	4	
	Q	.105	−.302	.353	−.108	.069	.022	−.101	.304	−.322	St. 3
6 Coöperation	No.	34	160	34	12	288	7	99	228	73	
	Q	−.077	.070	−.035	.008	−.186	.657	.245	.077	−.320	All st.
7 Interest in an occupation	No.	11	53	20	3	84	2	5	20	8	
	Q	−.139	−.148	.328	−.087	−.021	.233	.250	.031	−.172	St. 3

Continued on next page

TABLE XIX (*Continued*)

8 Exploration	No.	30	94	16	4	140	1	14	30	10	
	Q	.258	−.047	−.227	−.229	.299	−.470	.258	−.157	−.039	St. 1
9 Evidence of religious awakening	No.	4	22	7	2	33	1	12	22	11	
	Q	−.171	.526	.208	.202	−.246	.316	.136	−.087	−.017	St. 2
10 Gregariousness	No.	36	156	49	8	241	6	8	49	27	
	Q	−.079	−.176	.367	−.198	−.010	.513	−.226	−.074	.205	St. 3
11 Interest in causes	No.	7	28	10	2	45	1	1	10	2	
	Q	−.019	−.155	.247	.040	−.082	.166	−.219	.422	−.423	St. 3
12 Desire to reform others	No.	6	24	11	2	41	1	2	11	4	
	Q	−.058	−.235	.373	.090	−.132	.213	.037	.126	−.171	St. 3
13 Loyalty to a cause	No.	10	55	13	4	78	1	45	78	31	
	Q	−.151	.054	.056	.137	−.065	−.149	.293	−.103	−.159	All st.
14 Loyalty to a principle	No.	8	39	11	3	58	0	3	11	4	
	Q	−.099	−.035	.143	.141	.060	−1.	.276	.039	−.213	St. 3
15 Loyalty to a school	No.	33	99	24	7	156	4	10	33	7	
	Q	.261	−.170	−.000	.060	−.157	.357	−.038	.203	−.281	St. 1
16 Loyalty to a clique	No.	14	54	13	2	81	1	29	81	56	
	Q	.055	−.053	.030	−.282	.249	−.156	−.112	−.150	.267	All st.
17 Loyalty to a person	No.	6	35	10	1	51	0	2	10	3	
	Q	−.195	.001	.164	−.371	.520	−.1	.119	.172	−.277	St. 3

	TOTAL	TOTAL	ST. 1	ST. 2	ST. 3	TOTAL
Number showing any trait	487	515	130	631	126	887
P.E. of Q = O, within means independence,	±0305	±0296	±0592	±0271	±0616	±0227
Significant Q, 5 times P.E.,	.1525	.1480	.275	.134	.275	.114

TABLE XIX—(*Continued*)

DISTRIBUTIONS AND COEFFICIENTS OF ASSOCIATION FOR TRAITS, GIRLS

		A Normal IQ Normal Age For Maturing			B Normal IQ All Stages			C Normal Age for Maturing All IQ's			D Association Found
		Association of Trait with			Association of Trait with Type of Maturing			Association of Trait with			For Trait With
		St. 1	St. 2	St. 3	Early	Normal	Late	High IQ	Norm. IQ	Low IQ	
Total showing any Trait	No.	115	233	191	20	539	28	170	539	182	
1 Impatience with Restrictions	No.	10	31	40	2	81	5	6	40	13	
	Q	−.357	−.120	.330	−.233	.018	.110	−.152	.016	.075	St. 3
2 Self-Assertion	No.	33	64	61	6	158	10	57	158	51	
	Q	−.019	−.078	.097	.009	−.093	.145	.105	−.033	−.056	All st.
3 Sympathy for the weak	No.	23	51	59	6	133	8	6	59	8	
	Q	−.167	−.132	.247	.128	−.114	.094	−.298	.432	−.422	St. 3
4 Interest in the opposite sex	No.	15	30	59	5	104	3	8	59	21	
	Q	−.278	−.368	.501	.178	.089	−.337	−.250	−.007	.164	St. 3
5 Avoidance of the opposite sex	No.	10	21	24	1	55	4	5	24	8	
	Q	−.110	−.116	.190	−.376	−.011	.199	.043	−.061	.054	St. 3
6 Coöperation	No.	58	135	110	13	303	17	23	110	30	
	Q	−.147	−.062	.043	.178	−.129	.086	.154	.012	−.120	St. 3
7 Interest in an occupation	No.	19	31	34	3	84	3	27	84	21	
	Q	.044	−.154	.127	−.013	.128	−.211	.051	.078	−.175	All st.
8 Exploration	No.	16	38	26	5	80	8	45	80	22	
	Q	−.048	.101	−.077	.289	−.361	.381	.372	−.149	−.219	All st.

Continued on next page

TABLE XIX (*Continued*)

9 Evidence of religious awakening	No.	5	20	23	1	48	5	1	23	5	St. 3
	Q	−.426	−.035	.276	−.324	−.187	.387	−.633	.330	−.103	
10 Gregariousness	No.	37	87	93	9	217	10	25	93	30	St. 3
	Q	−.217	−.107	.263	.101	.014	−.010	.396	−.208	.031	
11 Interest in causes	No.	12	19	23	2	54	5	5	23	4	St. 3
	Q	.029	−.185	.167	−.022	−.211	.323	.138	.122	−.302	
12 Desire to reform others	No.	11	18	21	1	50	3	1	21	4	St. 3
	Q	.022	−.165	.152	−.324	.059	.089	−.595	.370	−.174	
13 Loyalty to a cause	No.	24	45	34	5	103	6	47	103	32	All st.
	Q	.071	.012	−.066	.167	−.114	.065	.248	−.101	−.114	
14 Loyalty to a principle	No.	29	130	25	3	84	3	13	29	10	St. 1
	Q	.387	−.187	−.151	−.013	.128	−.211	−.013	−.040	.083	
15 Loyalty to a school	No.	57	92	79	5	228	5	83	228	72	All st.
	Q	.131	−.102	−.030	−.353	.472	−.534	.168	−.004	−.094	
16 Loyalty to a clique	No.	4	27	41	2	72	5	10	41	14	St. 3
	Q	−.683	−.136	.473	−.172	−.051	.175	.149	−.120	.058	
17 Loyalty to a person	No.	20	33	35	5	88	7	32	88	11	All st.
	Q	.049	−.141	.111	.249	−.262	.251	.186	.167	−.520	

	TOTAL	TOTAL	ST. 1	ST. 2	ST. 3	TOTAL
Number showing any trait	539	587	201	406	284	891
P. E. of Q = L, within means independence,	±.0290	±.0275	±.0477	±.0337	±.0403	±.0227
Significant Q, 5 times P.E.,	.145	.1375	.228	.165	.193	.114

It is interesting to note that the only cases in which the trends shown in distributions by age differ radically from the trends shown in distributions by grade are those of low IQ girls for traits 2–3–4–11 and 12, and then only in certain stages. See Col. 8.

SUMMARY

1. The number of children exhibiting the trait varies regularly with chronological age or grade or both in the following cases:

GIRLS

IQ	*Trait*	*Increase with age*	*Decrease with age*
High IQ	Impatience with restrictions	x	
	Loyalty to a cause		x
Normal IQ	Avoidance of opposite sex	x	
	Loyalty to a clique	x	
	Loyalty to a person	x	
	Loyalty to a principle		x
Low IQ	Avoidance of opposite sex		x
	Loyalty to a principle		x
	Loyalty to a school		x

BOYS

High IQ	Interest in the opposite sex	x	
	Loyalty to a school	x	
Low IQ	Impatience with restrictions		x
	Evidence of religious awakening		x

c. Traits as Related to Stage and Type of Maturing

One of the questions most frequently asked in connection with traits is the question of their relation to the factor of maturity. Two phases of the topic are considered here:

1. Do children show the trait in one stage of maturity rather than in another? Are there "adolescent" traits?

2. Do children of one type of maturing show the trait rather than children of another type?

To answer these questions children of normal IQ are used, for the question must be answered, if possible, for the general run of human beings. These everyday children are divided into groups according to their type of maturing early, normal or late (see page 48). To answer question one, children of normal age for maturing are selected and the association of the trait with each stage of maturing is found. This is to show which stage has the largest proportion of children showing the trait. The base is *not* all children showing the trait, but all children of the stage in question. The Q's for the association of each trait with each stage are found in Table XX, Column A. The implications of these Q's are pictured in Figure 10, Column 9. A Q in Table XX (see trait 1 for girls) which runs from −.35 in stage one to +.33 in stage 3, is illustrated by an arrow, pointing toward the right (stage 3) with a minus sign at the left (stage 1) and a + sign at the head of the arrow (stage 3). "I" means independence, no association, i.e., Q is within its probable error; the trait is independent of the factor of maturing in that stage.

Another thing must be clearly understood if the tables are to be correctly interpreted. The *size* of Q, the *amount* of association, is of no concern here. It is enough if the association appears definitely in connection with one stage rather than another.

The interpretation of Q must not be confused with the manner of interpreting a Pearson product-moment r. Q and r are entirely different. r means that the appearance of one factor changes to the extent indicated by r in accordance with a change in the other factor. Q is simply a measure of the tendency of one trait to be found in association with another, regardless of the amount of either trait, and the problem here is of the latter type. The question to be answered is whether the trait belongs one place rather than another.

Figure 10, Column 9 gives definite signs of association in connection with certain traits. These are as follows:

With Stage1

Boys: +Association for 8, 15
No Association for 11
−Association for 3, 4, 9, 17

Girls: +Association for 14
No association for 2, 12
−Association for 1, 3, 4, 6, 9, 10, 16

With Stage 2

Boys: +Association for 9
No association for 3, 17
−Association for 4, 5, 10, 11, 12, 15

Girls: +Association for none
No association for 13
−Association for 4, 7, 11, 12, 14

KEY

1. Impatience with restrictions
2. Self-assertion
3. Sympathy for the weak
4. Interest in opposite sex
5. Avoidance of opposite sex
6. Coöperation
7. Interest in a particular occupation
8. Exploration
9. Evidence of religious awakening
10. Gregariousness
11. Interest in causes such as S. P. C. A.
12. Desire to reform others
13. Loyalty to a cause
14. Loyalty to a principle
15. Loyalty to a school
16. Loyalty to a clique
17. Loyalty to a person

With Stage 3

Boys: +Association for 1, 3, 4, 5, 7, 9, 10, 11, 12, 17
No association for 15
−Association for 8

Girls: +Association for 1, 3, 4, 5, 9, 10, 11, 12, 16
No association for none
−Association for 14

But these associations in certain cases may be due to chronological age. The *older* a child is, the longer he has lived among other human beings, the more chance he has of developing the trait. Hence, since third stage children are, on the whole, older than first, a third stage trait may be third stage because of chronological age and not maturity; or, on the other hand, a first-stage trait may be first because it is shown by younger children, not because the children are immature. For this reason it is necessary to examine these associations in connection with the distributions according to chronological age for the stage in which association occurs.

In Columns 2, 3, and 4, Figure 10, are given the trends in distribution according to age for children of each stage of maturity.

Trait 1, impatience with restrictions, shows an association with stage 3 (Fig. 10, Column 9) for the boys. Stage 3 in Column 3 shows a smaller and smaller proportion of the children showing the trait as they grow older. Evidently the trait is not a result of growing older, for it tends to disappear among the older children. The indications are, then, that the trait is shown by mature boys, "they feel their oats", but that it is ironed out of them as they grow older and learn to conform to others. The associations with early, normal, and late maturing show a plus association for the trait among the normal age for maturing, that is, the average child. The early maturing, however, give a minus association; the early maturing boys do not show the trait. For girls, the distributions according to age and grade show no trends in stage 3. There is no way of telling whether age has an effect or not. Among those of normal age for maturing there is no association with the trait; as many normal as early or late maturing show it. The minus association for early and the trend toward late maturing suggests that, as for the boys, the early maturing children do not tend to show the trait.

Trait 2 for boys, self-assertion, shows nothing except that again the early maturing do not show it and the late may or may not. The association for trait 2 for the girls gives a little more information, but not much. In Stage 1 for girls the trait is independent—about the same proportion show it there as show it in the other stages. There is a + association among the late maturing and the late maturing are largely first and second stage children (see page 48); hence, it looks as though maturing had little to do with the exhibiting of the trait among girls.

Trait 3 for boys—sympathy for the weak—is a trait shown largely by stage 3 children. No help in interpreting comes from the distributions by chronological age. The plus association with late maturing indicates that the trait is shown more often by the late maturing (who are in stages 1 and 2) than by the other types. These stage 3, who are early maturing, do *not* show it. Stage 3 who are normal age for maturing do show it markedly. In other words, early maturing most decidedly has an effect on the exhibi-

tion of the trait. For girls, trait 3 is also a third-stage trait. Although the distributions by chronological age for the trait are conflicting as a whole, the trend in stage 3 indicates a larger number of children showing the trait as they grow older. This would accord with the trend from stage 1 to stage 3, showing that either age or maturing might be at work; there is no way of telling which.

Trait 4 for boys, interest in the opposite sex, is another third stage trait—very markedly so—and type of maturing is influential since the late maturing boys show the trait in significant proportions. Nothing in distribution by age tells anything. The girls also show an association with stage 3, but there is no way of isolating the difference type of maturing makes since the association is with the early maturing children and they are mostly stage 3. It may be that stage 3 is causing the association rather than the early type of maturing. In connection with this trait with its marked associations, it must not be forgotten that the proportion of children showing the trait at all is only fifteen per cent. Only fifteen per cent of the boys and eighteen per cent of the girls have shown an interest in the opposite sex. Of those who show it, the associations spoken of above are true.

Trait 5 for boys, avoidance of the opposite sex, shows a plus association with stage 3 and a minus association with stage 2. That makes it quite definitely a third stage trait. Nothing can be said about the effect of the type of maturing and nothing about the effect of chronological age. For girls, also, stage 3 is indicated as characteristic and the type of maturing is influential in the showing of the trait. Girls of stage 3 in larger proportions show the trait as they grow older, however, and since they do not show it to any great extent till they are mature and hence older, age may be what is influencing the exhibition of the trait rather than maturity *so far as these data go to show.*

Trait 6 for boys, coöperation, gives little except that the late maturing show it and the normally maturing do not. An age distribution gives no aid in defining the conditions favorable to the exhibition of the trait. Among the girls, the immature children do not show it; the early maturing do—statements which do not contradict each other, at any rate, since the early maturing chil-

dren are largely third stage. The distribution, according to age, gives nothing, but that according to grade shows more and more second stage girls showing the trait as they grow older. This would in no way contradict the other statement that it is not a trait of immature children.

Trait 7 for boys, interest in a particular occupation, is a stage 3 trait and the type of maturing affects the proportion of children showing it. More and more children show it as they grow older. Hence it is impossible to tell whether chronological age or maturing has the effect. The fact that it is a late maturing trait would tend to confirm the idea that age is a determining factor. In the case of the girls, stage-2 children do not show the trait and late maturing (stages 1 and 2) do not show it. No trend is indicated in age for stage 2. All that can be said is that the trait is not prominent among children who are still immature.

Trait 8, exploration, is, for boys, a first stage trait. It is largely a trait shown by children who mature at a normal age. It is affected by the type of maturing, for in spite of the fact that it is a first stage trait, the association among the late maturing (stages 1 and 2) is minus. Among the girls, there are no indications of association with any particular stage. However, that is not surprising since there is a minus association with the normal age for maturing. It is a trait shown by early or by late maturing girls, and type of maturing seems to make a vast difference in the numbers of girls who show it.

Trait 9, evidence of religious awakening, is, for boys, not a trait of immature children; the maturing and the mature show it. It is most important among the early and the late maturing, however. The chances are that type of maturing makes little difference in the showing of it since stages 2 and 3 are both so strongly represented among the early and late maturing. For girls, trait 9 is a stage 3 trait and although there is no trend for age indicated, there is one for grade. The higher the grade, the greater the proportion of stage 3 girls who show the trait. Society or maturing then is at work, or perhaps both, of course, and since the late maturing, stages 1 and 2, show it in excess of the others, it seems quite evident that society is an influential factor. But one must not forget that only seven per cent of the boys and nine

per cent of the girls have shown this trait in this school situation.

Trait 10 for boys, gregariousness, is obviously a stage 3 trait. It is another trait shown by late maturing children. Nothing is shown about the influence of age, and consequently it can be described merely as a third stage trait in which type of maturing determines the proportions of boys who exhibit it. For girls, trait 10 is a stage 3 trait. Type of maturing rather obviously has little effect on its exhibition. There is no trend indicated in age, but the trend in grade is toward larger and larger proportions of girls showing it, the trait, with their advance in grade—a learned trait, perhaps.

Trait 11 for boys, interest in causes, is shown by third stage children more than by first or second, and by late maturing children—about all we can say about it. For girls, the same thing holds true.

Trait 12 for boys, the desire to reform others, is shown under about the same conditions as is trait 11, but trait 12 for girls, while in general the same, gives us additional information in its distribution according to age. Girls show the trait in increasing numbers as they grow older. Maturity or age or learning or all three of them may be at work.

Trait 13, loyalty to a cause is, for boys, hardly a trait of late maturing children. For the girls, there is the same meagre information. *Perhaps* it is a trait of the early maturing.

Trait 14, loyalty to a principle, seems to be for boys a stage 3 trait, since the trend is toward stage 3 and toward the early maturing. For girls it seems to be definitely a first stage trait with fewer and fewer girls showing it as they grow older. This is confirmed by the minus association in late maturing since the late maturing are the older first and second-stage girls. In fact, the various distributions for this trait fit together very nicely to prove it a trait of immature girls.

Trait 15 for boys, loyalty to a school, is also a first stage trait that may or may not last (note the "I" in stage 3). The late maturing show it, as would be expected since the late maturing are first and second stage children. Among girls, the trait is shown largely by those of the normal age for maturing; other types do not show it. Among the normal age for maturing, however, stage has little effect.

Trait 16 for boys, loyalty to a clique, is as indefinite in its indications as is trait 15 for girls. It is shown by boys of the normal age for maturing but not by the other types. Stage has little effect. For the girls, however, it is definitely a third stage trait, increasing with chronological age and grade; hence there is no telling to which factor to attribute the association. Type of maturing is related since it is a trait shown by late maturing children who according to their distribution by age (stages 1 and 2) show it in fewer and fewer numbers as they grow older. Type of maturing most decidedly counts.

Trait 17, loyalty to a person, for boys is a stage 3 trait and again type of maturing is related to the proportion of children showing it, early and late maturing rarely showing it. Among the girls, the early and the late maturing show it—the opposite to the situation among the boys. Stage itself, however, makes little difference in the showing of it.

Summary

Two questions in this part of the section on traits have been considered.

1. Do children show the trait in one stage of maturity rather than in another? Are there "adolescent" traits?

2. Do children of one type of maturity show the trait rather than children of another type?

An "adolescent" trait would be one showing practically not at all among the immature, appearing with stage 2 or stage 3 and doing so consistently, regardless of type of maturing. Of these traits only trait 9, evidence of religious awakening, for boys, and trait 10, gregariousness, for girls, at all fulfill the requirement.

1. Certain traits, however, stand out as characteristic of children in one stage rather than in another:

In Stage 1:
For boys: Exploration, loyalty to a school
For girls: Loyalty to a principle

In Stage 2:
For boys: Evidence of religious awakening
For girls: None

In Stage 3:

For boys: Impatience with restrictions, sympathy for the weak, interest in opposite sex, avoidance of opposite sex, evidence of religious awakening, gregariousness, interest in causes such as S. P. C. A., desire to reform others, loyalty to a person.

For girls: Impatience with restrictions, interest in opposite sex, interest in causes such as S. P. C. A.

2. Certain traits are apparently influenced by chronological age:

For boys: Interest in a particular occupation

For girls: Avoidance of opposite sex

3. Certain traits are apparently influenced by grade:

For boys: None

For girls: Evidence of religious awakening, gregariousness

4. Certain traits might obviously be influenced by maturing or age or both:

For boys: None

For girls: Sympathy for the weak, desire to reform others
Loyalty to a clique

5. Certain traits are influenced by type of maturing:

For boys: Impatience with restrictions, sympathy for the weak, interest in opposite sex, coöperation, interest in a particular occupation, exploration, gregariousness, interest in causes, desire to reform others, loyalty to a cause, loyalty to a clique, loyalty to a person.

For girls: Impatience with restrictions, self-assertion, avoidance of opposite sex, coöperation, exploration, interest in causes, desire to reform others, loyalty to a school, loyalty to a clique, loyalty to a person.

6. Certain traits are not influenced by type of maturing;

For boys: Evidence of religious awakening, loyalty to a principle, loyalty to a school.

For girls: Gregariousness, loyalty to a principle.

d. Traits as Related to IQ

It is quite possible that IQ is responsible for traits rather than (or in conjunction with) maturing. Something about this phase of the problem comes out in examining the traits exhibited by children of different IQ's among those of normal age for maturing. The stage we have found to be associated with the trait must be

considered, for that is the condition under which the trait is most frequently manifested. If the association with the trait in this stage does not differ materially with a change in IQ, then it is possible to say that IQ has little relation to the exhibition of the trait. If the association differs, if there is a plus association, with high IQ and a minus association elsewhere, then the trait is a trait shown largely by high IQ children. Table XX, Column C, gives the Q's for these associations of IQ with each trait in its characteristic stage, Column D, for children the normal age for maturing. Where there is no characteristic stage, where stage seemingly makes little difference, the association between IQ and the trait for all stages combined is used.

Figure 10, Column 11, shows that the associations with IQ exhibit trends of different sorts for the different traits. The trends are quite marked in several cases. Again the *size* of Q—the *amount* of association—does not matter. All that is important is the fact of its existence as indicated by a significant Q (over 5 times the probable error) or a Q showing independence (within the probable error or near it).

In the first place some traits seem independent of IQ. Nowhere is there a trait clearly independent of association in all three groups of IQ, but sometimes one is almost independent.

For boys, impatience with restrictions comes quite near to independence in all three stages. It would be safe to say that IQ had little to do with the exhibiting of the trait in boys. This is not as true for the girls, although the associations themselves are low, for there is a trend toward low IQ. The trait may be a low IQ trait for girls, although we cannot say so with reason.

For boys, self-assertion is in much the same position as trait 1, probably independent of IQ. In girls also the associations are low, but there is a trend toward high IQ.

Trait 3 for boys, sympathy with the weak, gives little except that low IQ boys do not show it. For the girls it is clearly a trait shown by children of normal IQ. Neither high nor low show it to any degree.

Trait 4 for boys, interest in opposite sex, is without doubt a high IQ trait, but for girls the indications are that it is a low IQ trait. It is not high at any rate, as is shown by the association with high IQ.

Trait 5, avoidance of the opposite sex, is shown by boys of normal IQ and not by those of low. It would be hard to say which is more significant the + in normal or the − in low for our purposes. For girls, although not within the probable error, the association is very near it and the trait is possibly independent of IQ.

Trait 6, coöperation, is another high IQ trait for boys. For girls there is a decided trend toward high IQ, although the association is not close enough to be significant.

Trait 7, interest in a particular occupation, shows a trend toward high. For girls, the trait is not shown by low IQ children, but that is all that can be said about it.

Trait 8, exploration, for boys is almost significantly high in association, but it cannot be so listed because it does not quite reach the necessary limit. For girls the trait is obviously high.

Trait 9, evidence of religious awakening, is probably high for boys and not high for girls; girls of normal IQ show it most definitely.

Trait 10, gregariousness, for boys shows a trend toward low IQ while for girls it is decidedly a high IQ trait.

Trait 11, interest in causes such as S. P. C. A., is shown among boys by those of normal IQ and *not* by those of low; among the girls there is a trend toward high and a minus association with low IQ.

Trait 12, desire to reform others, shows little in the Q's for boys, but those for the girls show decidedly that this is not a high IQ trait. It is independent for the boys—minus for the girls. Normal IQ girls show it.

Trait 13, loyalty to a cause, for boys and for girls is clearly a high IQ trait.

Trait 14, loyalty to a principle, is probably high IQ for boys. It comes very near to being independent for the girls.

Trait 15, loyalty to a school, for boys is not low IQ, at any rate. For the girls there is a trend toward high IQ.

Trait 16, loyalty to a clique, is shown by low IQ boys. The association for the girls tells us nothing.

Trait 17, loyalty to a person, is not low IQ for boys, but that is all that can be said definitely. Neither is it low for the girls; for them it is high.

SUMMARY

1. Certain traits show, on the whole, independence of IQ:
   Boys: Impatience with restrictions, self-assertion
   Girls: Impatience with restrictions, avoidance of opposite sex, loyalty to a principle
2. Certain traits are associated with high IQ:
   (a) Definitely so—confirmed by significant associations—
      Boys: Interest in opposite sex, coöperation, loyalty to a cause
      Girls: Exploration, gregariousness, loyalty to a cause, loyalty to a person.
   (b) Indicated by trends toward high or by a single association—
      Boys: Interest in a particular occupation, evidence of religious awakening, loyalty to a principle.
      Girls: Self-assertion, coöperation, interest in causes, loyalty to a school
3. Certain traits are associated with low IQ:
   (a) Definitely—
      Boys: Loyalty to a clique
      Girls: None
   (b) Indicated by trend toward low IQ
      Boys: Gregariousness
      Girls: Impatience with restrictions, interest in opposite sex
4. Certain traits are associated with normal IQ:
   (a) Definitely—
      Boys: Avoidance of opposite sex, interest in causes
      Girls: Sympathy for the weak, evidence of religious awakening
   (b) Indicated as not low IQ—
      Boys: Sympathy for the weak, avoidance of opposite sex, interest in causes, loyalty to a school, loyalty to a person
      Girls: Interest in a particular occupation, interest in causes
   (c) Indicated as not high IQ—
      Boys: None
      Girls: Desire to reform others

5. *Summary*

1. Among both boys and girls the same four traits, self-assertion, coöperation, gregariousness, and loyalty to a school, are exhibited most frequently, and the same three, evidence of reli-

gious awakening, interest in causes, and the desire to reform others, least frequently.

2. Chronological age seems to be closely related to the appearance of some traits: among girls, impatience with restrictions and avoidance of the opposite sex; among boys, interest in the opposite sex, loyalty to a school, loyalty to a clique, and loyalty to a person. Chronological age seems obviously not connected with the appearance of others: among girls, loyalty to a cause, loyalty to a principle, avoidance of the opposite sex, loyalty to a school; among boys, impatience with restrictions and evidence of religious awakening. Generally, however, the influence of age cannot be separated from the influence of other factors, noticeably that of progress through the grades.

3. Since an adolescent trait would be one shown practically not at all among the immature but appearing with stage 2 or stage 3, and doing so consistently regardless of type of maturing, the inaccuracy of speaking of this list of seventeen traits as adolescent traits is obvious; only evidence of religious awakening for boys and gregariousness for girls can lay any claim to the title, since all the rest appear among children of all ages and all stages of maturing.

4. Certain traits, however, are definitely associated with stage 1, stage 2 or stage 3 and hence seemingly characteristic of that stage of maturity.

5. Frequently the association with a trait is different for different types of maturing. Type of maturing seems to have a definite relation to the exhibition of certain traits.

6. In many cases the trait is associated with one IQ and not with another. There seems to be evidence that IQ is closely connected with the exhibition of the traits.

V

The Contribution of this Study

The results of this investigation contribute to the material on different phases of physiological maturation by showing:

1. A distribution according to stages of maturity of practically an entire school system, grades 4–12.
2. A stage of physiological maturity for each child given by well-qualified physicians.
3. A relationship between stage of maturity and nationality.
4. A relationship between stage of maturity and grade.
5. A relationship between stage of maturity and traits of personality, with the influence of IQ on each trait carefully isolated as far as possible.

Out of these interesting overlapping relationships emerge certain implications. In connection with the age of maturing, perhaps the most interesting is the striking similarity between the median ages for maturing in second stage boys and girls when the stage 1+ boys are grouped with the stage 2, where they obviously belong. In this study, the median age for maturing for girls is only a little over seven months earlier than that for the boys. Maturing starts much earlier for these children on the whole than has been suggested by most other investigators, for at the age of 13 only 7 per cent of the boys and 5 per cent of the girls are immature. In general the data seem to show that there is a long time—several years—over which the short period of maturing—may take place.

In connection with progress through school, the graph showing the distribution of children of different stages throughout the grades emphasizes again the early appearance of maturing in a large proportion of the children. The fact that early maturing and underage are found together is not as important as it seems to be when the possibility that the early maturing child might have started school earlier is recognized. The fact that late maturing is no disadvantage to a bright child when it comes to getting good marks in school is much more significant.

In connection with traits of personality there are several interesting suggestions. The fact is worth noting that only in the case of low IQ girls are there any marked differences in the trends indicated by the per cents of children showing traits when the distributions according to chronological age are compared with the distributions according to grade, and then only for a few traits and certain stages. It is almost impossible in most cases to separate the influences of age and of passage through school. When, however, age and grade, insofar as they can be separated, and stage of maturity and type of maturing are each isolated so that the chances of pyramiding in influence and of offsetting in influence can be evaluated, some relationships still seem to hold true.

First, exploration and loyalty to a school are traits of immature boys, and loyalty to a principle is a trait of immature girls. Evidence of religious awakening, when found at all, is characteristic of maturing boys. Mature boys and girls are more likely to show the following traits than are boys and girls of the other stages: third-stage boys show impatience with restrictions, sympathy for the weak, interest in the opposite sex, avoidance of the opposite sex, evidence of religious awakening, gregariousness, interest in causes, desire to reform others, and loyalty to a person; third-stage girls show impatience with restrictions, interest in the opposite sex, and interest in causes. Boys and girls of stages 1 and 2 are more alike in traits they do not show than in traits they show. Third stage children are more alike in what they show.

Next, chronological age rather obviously bears some relation to the appearance of interest in an occupation with boys and of avoidance of the opposite sex with girls, since after accounting for other possible influences, boys show their interest in increasing numbers as they grow older and girls of low IQ rapidly lose the avoidance they seem to manifest in their earlier years. Progress through school (learning, perhaps) seems to coincide with the exhibition of evidences of religious awakening and of gregariousness in girls.

Type of maturing, though it seems to be related to the number of children exhibiting many of the traits, seems to have no relation to the appearance of evidences of religious awakening and

loyalty to a principle and loyalty to a school in boys, and in girls, gregariousness and loyalty to a principle.

The relationship of IQ to the exhibition of traits is also subject to the influence of other factors. Evaluating these and isolating IQ insofar as it can be isolated, gives only four traits apparently independent of relation to IQ: impatience with restrictions and self-assertion for boys and impatience with restrictions, avoidance of the opposite sex, and loyalty to a principle for girls. There are many indications (given in the summary on page 110) as to the relationship between the exhibition of traits and IQ so that it seems rather evident that IQ plays an important part in determining which children exhibit which traits.

Perhaps in the light of the present interest in adolescent traits, the most significant thing that comes out in this study is the appearance of only two traits that can actually be called adolescent: evidences of religious awakening for boys and gregariousness for girls. All the other traits appear noticeably among children of all ages and in all stages of maturity.

The relationships that have been cited here are merely implications of tendencies—all that group material can give. Much more work must be done along these lines—work done with children each of whom is measured over and over again—before the implications can become certainties. If implications of tendencies are of value, however, to those interested in how boys and girls grow up, then the study has been worth while.

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